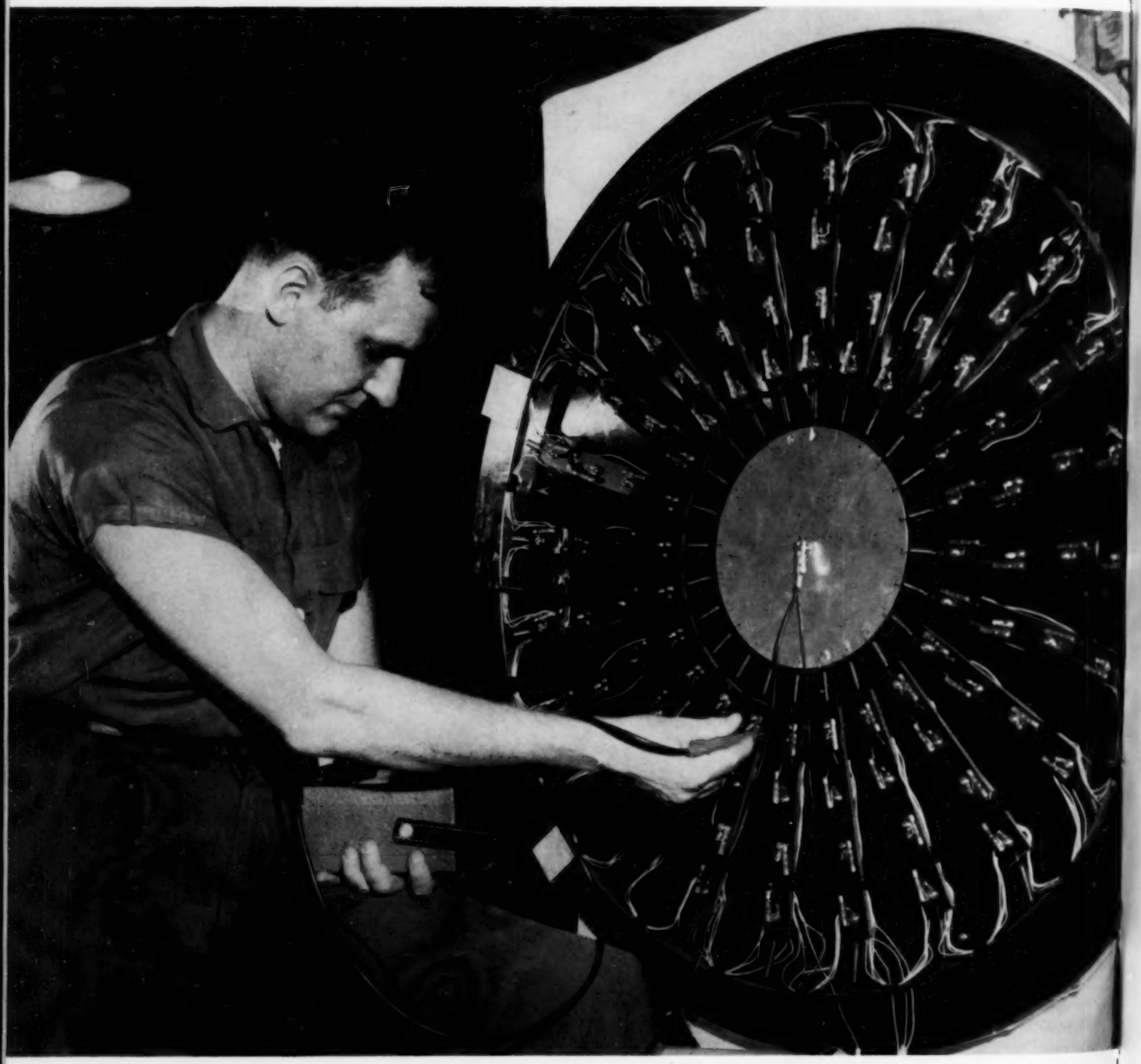
OCTOBER
1957
VOLUME 6
NUMBER 10

Battelle Technical Review

IN THIS ISSUE:

Electricity and Agriculture

This unique circular environmental oven is used in studies of the behavior of electronic components. It simulates heat and voltage conditions approximating those under which components will actually be used. The radial arrangement for mounting 192 components was chosen to simplify the standardization of capacitance between components—in this case capacitors. During studies, components are checked frequently to detect failures. The oven is one of a group designed and built by members of Battelle's reliability engineering division.



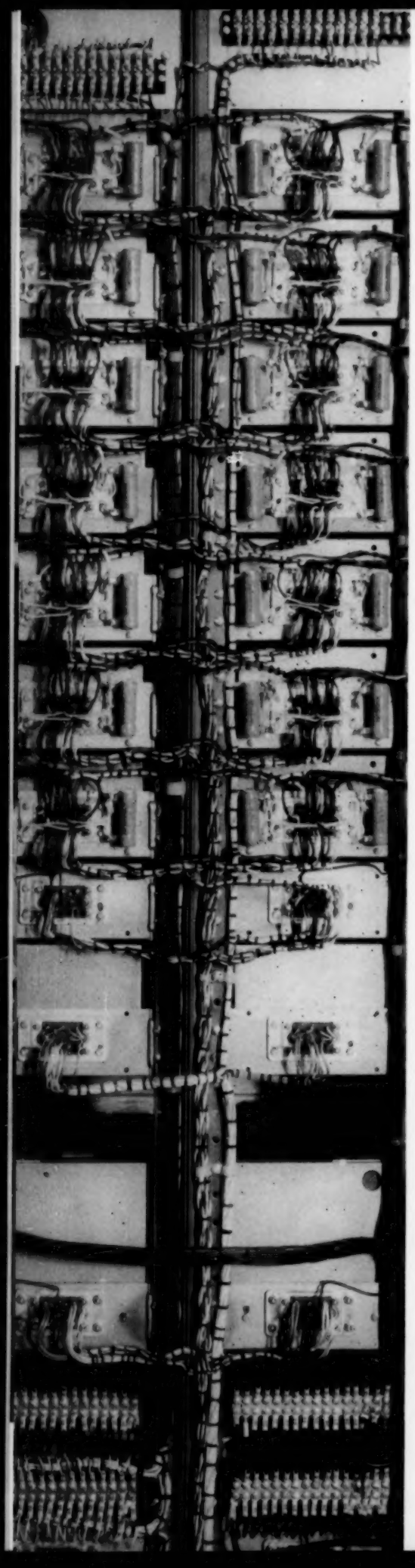
CHECKING COMPONENTS IN ENVIRONMENTAL OVEN

Volume 6, Number 10
October 1957

BATTELLE TECHNICAL REVIEW

Dedicated to the dissemination of knowledge. Published monthly by Battelle Memorial Institute, an endowed foundation serving mankind through science and technology.

Published monthly by Battelle Memorial Institute. Please address all correspondence about articles, abstracts, subscriptions and exchanges to: The Editor, Battelle Technical Review, Battelle Memorial Institute, 505 King Avenue, Columbus 1, Ohio. Accepted as controlled circulation publication at Columbus, Ohio. Printed in U. S. A.



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Pebble in a Pond

WHEN A PEBBLE is tossed into a pond, at first, only a surface of water slightly larger than the pebble itself is rippled. But the initial disturbance rapidly propagates itself, and, soon, areas far from the target spot are affected. This is axiomatic because of the continuous nature of the medium.

Scientific research is like tossing a pebble into a pond. In one way or other, every little splash of accomplishment affects all other scientific efforts to some degree, even if very slightly. For science, too, is a continuous medium through which all disturbances radiate in wave-like pattern. And what is learned in any one laboratory today may be the very increment in knowledge—the minute addition of propagated energy—that will make something else possible in another laboratory tomorrow.

Stripped of its convenient classifications, science flows one part into the other, and there are no real boundaries between disciplines. Neither are there real boundaries between pure and applied science, or technology and engineering, since an accomplishment at any point can cause a ripple throughout each and throughout the whole.

The continuous nature of science is frequently illustrated by striking examples of information from one field being applied to another. Thus, recently, surgeons at Wayne University were able to repair a valve in a human heart by inserting into the heart a spring made from an alloy developed at Battelle. The alloy was not developed for cardiac prosthetic purposes, but in an industrial project aimed at finding the best material for watch mainsprings. Its properties met the specifications for the uncontemplated surgical use as excellently as it met specifications of watch technology. Curiously enough, the process used to make the heart-spring compatible physically with heart tissue was a process perfected to give smooth finishes to such commonplace articles as automobile parts, refrigerator trim, and household hardware. Heart surgery is a long way from watch manufacture or metal finishing, but the pebbles tossed here created the ripples that made possible this new technique for saving human lives.

In less dramatic ways, the continuum of science works its wonders. Tiny achievements in biology, chemistry, physics, minerals and petroleum technology, and mechanical engineering—these altogether have created the mass wave that has given the United States and many other sections of the world their present abundance of food. If a quarter of a century ago, when the fulfillment of the predictions of Malthus seemed imminent, all scientific effort had been channeled to the single problem of food supply, in all probability all of the world would now be hungry. For had research been dropped in a thousand and one technologies, myriads of all-important remote ripples would not have been generated.

No research is unimportant, economically or socially, as long as it is conscientiously done in the true spirit of science. And the job of no research worker is insignificant, no matter how far from the spotlight. For who knows when a pebble is tossed where one of its waves may land?

Robert E. Greenlee, Consultant
Battelle Memorial Institute

VIGNETTE

SYSTEMS ENGINEER

J. James Stone, Jr.

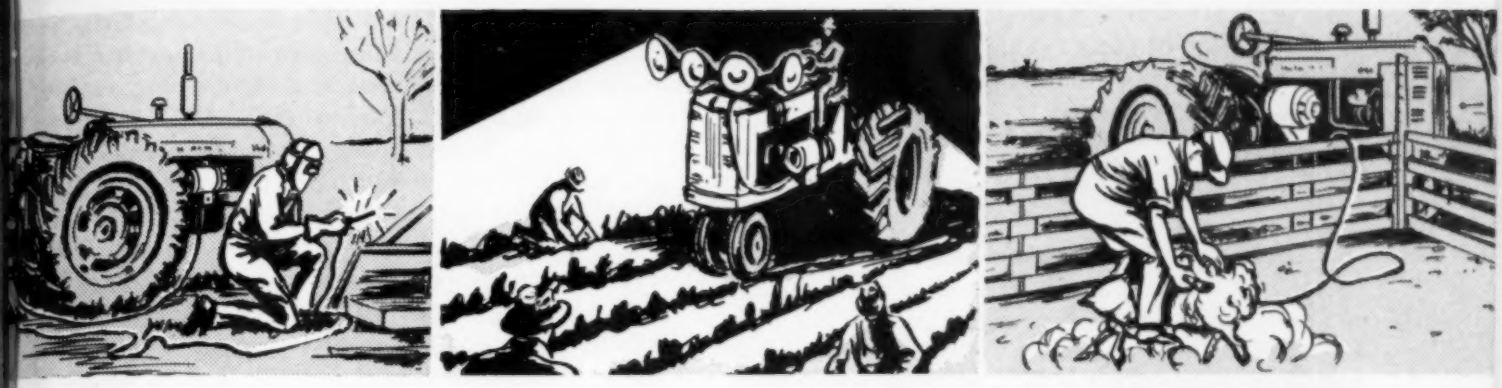
The rise in the use of the electronic computer has been phenomenal, yet we have barely begun to utilize it in many phases of our lives, asserts J. James Stone, Jr., who directs systems engineering research at Battelle. The true potentialities of the computer will be realized, he believes, only with the growth of a clear understanding of its capabilities. While this realization is coming about, technologists are moving ahead in developing more effective machines, better programming techniques, and improved methods for applying computers to new and unusual problems.

The application of electronics to computation has been a prime interest of Jim's since his engineering school days. Both his B.S. degree from Virginia Polytechnic Institute and his M.S. from Harvard University were gained in the field of electronics and communication. After a short stint on the V.P.I. faculty, he went to Oak Ridge where, as senior electrical engineer, he aided in the development of a specialized digital computer for the Nuclear Engine for the Propulsion of Aircraft Project. Later, he aided in the development of the Oak Ridge National Laboratory's Reactor Controls Computer.

Jim has participated in and directed varied research studies since his association with Battelle. One of his interests has been the development of special purpose computers. He has utilized analog computers for the simulation and study of both mechanical and nuclear systems and he has applied electrical and electronic principles to the solutions of varied equipment control problems. Jim and his colleagues have investigated computer procedures for such uses as research, design, production, and information processing. At the same time he has guided the growth of the Institute's computational center, which now includes extensive digital and analog facilities.

Jim's research activities have led to more than a dozen articles and two computer patents, with two more pending. He is a member of the Research Planning Committee for Industrial Data Processing of the American Institute of Industrial Engineers and holds membership also in the American Institute of Electrical Engineers, the Midwestern Simulation Council, and the American Association for the Advancement of Science.

At home, Jim's activities are varied. A confirmed "do-it-yourself" addict, he relaxes with fishing and golf and enjoys camping with his wife Evelyn and their two young daughters.



Mobile electric power supplied by a tractor-mounted and -powered generator can be highly useful to farmers. Possible uses shown here include (l. to r.) supplying current for welding, lighting for night work or for the photo-period effect upon plants, and shearing sheep in holding pens on the range.

Electricity and Agriculture

by Harold J. Behm *and*
R. Glenn Fuller

Electric power is playing an increasingly significant role in agricultural production. The authors believe that electrical and electronic developments now under study in laboratories will greatly improve our farming methods and help satisfy contemplated growing demand for farm products.

The use of electricity on the farm is in a period of transition. The first half of the 20th century has seen central-station electricity brought to more than 93 per cent of U. S. farms. The second half of the 20th century will undoubtedly witness wide scale application of this new farm servant to reducing farm drudgery and increasing production per farm worker. When one considers that practically all of the present day applications of electricity to agriculture and industry have been developed since the beginning of the century, it is apparent that developments in agriculture over the next half century are likely to appear revolutionary from our present viewpoint.

Something of what may be in store for agriculture can be gathered from electrical and electronic developments that have brought momentous changes in manufacturing and other industries. Currently, the average worker in manufacturing industries uses approximately 20,000 kwh annually to aid him in producing goods. This contrasts with the 2,500 kwh used by the average farm worker. The difference is likely to be reduced considerably by the year 2000 as farmers turn more toward electric power to aid them in increasing the efficiency of their operations.

From recent trends, it is clear that by the end of this century our population could conceivably almost double. But even a smaller growth would greatly increase the need for farm products. Moreover, there is a growing demand for agricultural products for industrial processing. Yet in the face of this rising need, both our farm population and available land are shrinking. From 1939 to 1949 farm population dropped ten per cent, and in 1950 alone, 400,000 left U. S. farms. At the same time the loss of land to suburban development is accelerating. It is estimated that such losses may reach 15 million acres in the next 25 years.

Obviously, this situation calls for an increasingly efficient system of agriculture. On the basis of our experience in the field of manufacturing, the new equipment and techniques required to meet the needs will depend heavily upon electric power. While many useful developments are already finding their way to farms, additional research is needed to make the most of this available energy which can replace or improve the productivity of man.

One of the factors that may slow the widening use of electricity is the form in which it is made available. Most farms today have only single-phase power. Only relatively large farm units have three-phase power. Really large-scale use of this form of energy will re-

quire perhaps 440 volts, three-phase, as is now utilized in most industrial plants. Thus the problem of distributing adequate central-station power to farms is not yet completely solved.

Current Farm Applications of Electric Power

If, suddenly, electrons should rebel and all devices operated electrically became useless—the industrial worker and the city worker would be most hard hit. Of course, many farmers would also find themselves immediately affected. For example, they would probably have to pump and carry water for household and livestock uses. They would have to carry lanterns to do chores about the farmstead after dark. The weather and market information services provided by radio and television would not be available. And on many farms, feed grinding, milking by machine, milk cooling, insect killing, and a host of other operations would come to a standstill.

The farm of 50 years ago made little use of electric energy. Today the farm has a wide array of electrical devices operating to reduce the labor requirements, both in the farm operation and in the farm home. It appears that electricity is the servant of the farmer. Yet, when we note that the industrial worker uses about eight times as much electricity as the farm worker, we see that electricity is still primarily the servant of the industrial worker.

Lighting and domestic uses of current are found on all electrified farms, but many types of electrical equipment are in use on only a few farms, as shown in the table on page six. Exen in the instance of lighting, there is much room for improvement. On most farms, the consumption of electricity for lighting alone could profitably be increased two or three times to provide a more efficient, safer, and more pleasant environment for after-dark operations. Particularly in farm areas near cities, there is need for security lighting around the buildings and high value crops.

Electricity in the Production of Livestock

Electrical equipment is widely employed in some phases of the livestock industry. In the poultry industry, perhaps 90 per cent of all eggs are hatched by electric incubators. The use of illumination to extend the laying day is even more universal. In many large poultry plants, electric brooders, feeders, waterers, ventilators, and even egg gatherers are in use.

Similarly, the dairy industry has made considerable use of electrical equipment such as milking machines, coolers, barn cleaners, and so forth. Normally, the poultry and dairy farms are concentrated nearer the centers of population and consequently are subject to higher labor costs than other farm operations. To combat these higher labor costs, more use has been made of electrically powered labor-saving devices. However, in both the poultry and dairy industries, it has been the larger producers who have made most extensive use of electrically operated equipment. Thus, it is estimated that, on the average, 53 man hours are still required to produce $100 worth of milk. If the available supply of labor continues to shrink and its cost continues to go up, producers, particularly the smaller ones, will be forced to employ more electric energy to do their work if they are to remain in business.

Materials Handling

Certainly one of the major problems in farm operation is that of materials handling. Estimates indicate that the materials handled on the farms in the United States approach a billion tons annually. Prior to World War II, a large percentage of this was handled manually at least once. Since then, some improvement has taken place, but there is still much room for development of materials-handling methods and equipment. It is probable that much of the advancement in the future will be with the assistance of electrically pow-

This article reflects Harold Behm's current responsibilities and interest in electrical engineering as well as an earlier interest in agriculture as a Future Farmer. At Battelle, he has been concerned primarily with the study of automatic methods for handling engineering data and has also participated in servo-mechanism development. The author's earlier experience with the Delco Products Division of General Motors Corporation, included the design and development of motors and generators to meet farm requirements.

Glen Fuller is professionally interested in both agricultural and biological problems. Among those which he has studied since joining Battelle have been the evaluation of chemical and pharmaceutical materials for agricultural use, the utilization of plants as accumulators of scarce metals, and the application of trace minerals to plant nutrition. He has also guided biological and corrosion studies of materials in marine environment. Earlier, before joining Battelle, the author directed field operations in connection with the production of canning crops and participated in studies of the forecasting of crop maturity.

ered conveyors, blowers, trucks, pumps, and other devices to reduce hand labor in the handling of farm products, needed materials, and farm wastes.

Applications Under Development

Most new developments in agriculture require anywhere from five to 20 years to achieve wide application after they have been proved useful in the laboratory. An example may be found in the frozen food industry. In the early 1930's, many laboratory workers were eating frozen strawberries for Christmas, while such a delicacy was unheard of by most people. The first wide-scale use of frozen foods came just before World War II. The war interrupted further development of the field. However, following the war, came the wide-scale production and usage of frozen foods we know today. Hence, it is possible to extrapolate from present laboratory developments and arrive at an estimate of some of the uses of electricity in agriculture in the early part of the next half century.

Mobile Electric Power

Thirty years ago, power in most small industrial plants was supplied from one prime mover—an engine or large motor with belt drives to each machine. Today each machine has its own motor and some single machines have many motors. Most farm machines operate from a single power source with belts to drive various components. However, as equipment becomes more complex, the use of several smaller motors is likely to become desirable. Such individual electric drives permit the machine to function more efficiently. Mobile generators would make practicable the use of such electrically driven equipment in the field.

The availability of appreciable amounts of electric power in the field will also permit use of operations not otherwise possible. For example, field repair of machinery is facilitated by permitting the use of welders, drills, and other electrically powered tools. Tractor-mounted, electrically powered insect- and weed-killing devices may also be possibilities.

Environment Control

While air conditioning is also found in some farm homes, one is more likely to find it in the poultry house, hog house, or dairy barn. A number of tests have shown that where optimum temperature and humidity are maintained farm animals can make much more efficient use of feed. Hens lay more eggs, and hogs and cattle add more weight per unit of food. During a seven-week period covering most of July and August, a poultry farmer in Texas tested the effects of cooling upon a flock of 950 hens, using a control flock of the same size. While the hens in the cooled poultry house laid a total of 18,950 eggs, the control flock produced only 10,803. Two hens in the cooled house died while 18 of the control flock died.

Automatic feeding of stock and air-conditioning of barns can increase a farmer's income and reduce the time required for the care of his animals.

Future Applications

The latter part of the next half century will see application of many things not even under consideration at the present time. With consideration of some of the basic principles of physics, chemistry, biology, and other related fields and a scattering of information available from isolated studies today—plus a little imagination—it is possible to suggest some of the developments in electroagriculture which may occur and be put into use.

Control of Plant Growth

One of the potentially valuable areas for the utilization of electricity in agriculture is in the control of the growth of plants. Nearly forty years ago workers in the U. S. Department of Agriculture discovered that the development of certain plants, particularly their flowering, was regulated by the amount of daylight during

The use of infrared lamps to protect crops from frost is an interesting possibility for electrified farms.

the growing period. Investigations stemming from this discovery have since led to the classification of many species as "short-day" or "long-day" plants, depending on their photoperiod requirements. The principle has been put to widespread practical use in commercial floriculture, where market requirements make precise timing of production essential. For example, the flowering of chrysanthemums, a "short-day" plant, can be effectively delayed during fall and winter months by using electric lights to increase day-length.

In practice, regulation of flowering by control of the photoperiod has been almost entirely confined to glasshouse crops. Providing continuous supplemental lighting for large acreages of farm crops presents obvious difficulties. Recently, however, it has been shown that subjecting plants to a single short flash of light during the dark period may be as effective in securing the photoperiod response as continuous light of several hours duration. This finding brings us a step nearer the possibility of regulating the flowering of farm crops by the use of artificial light. Where short exposure is sufficient, high-intensity lights mounted on a tractor might provide adequate exposure.

Plant development is affected not only by the duration of exposure, but by the wavelength of light as well. The action spectrum for photosynthesis resembles that for photoperiod responses, but is not identical with it. Stem elongation, stem bending in response to light, seed germination, and other growth phenomena are affected differently by different wavelengths of light. The use of electric lights of a specific wavelength to regulate or stimulate specific plant processes is still only a research method—though a highly successful one—for exploring the mysteries of plant growth. But the next 50 years may very well see the method put to work in practical agriculture.

The influence of electrical currents and of electrostatic and electromagnetic fields on plant growth has been investigated only to a limited extent, although certain theoretical considerations suggest that these forces could have physiological effects. Plants exhibit well-defined electrical polarities, the terminal portions of stems, branches, and leaves being generally electronegative relative to basal portions. Under the influence of such differences in potential, measurable currents flow between different plant parts. Whether these electrical phenomena play a part in regulating and correlating plant growth, as has been suggested by some investigators, or whether they are merely the secondary result of other processes, has not been demonstrated. If the former alternative is correct, the subjection of plants to external electrical forces could conceivably alter growth.

From time to time reports have appeared in the literature of plant physiology, and elsewhere, purporting to show that plant growth is affected when the plants are grown in certain types of electrical fields or are made part of an electrical circuit. A reliable, though preliminary report of the effect of low-voltage discharge on seeds is discussed below. Unfortunately, the reported findings with respect to electrical effects on growing plants are less conclusive. In 1926, a group of U. S. Department of Agriculture scientists concluded

Use of Electrical Equipment on Farms

Item	*Per Cent of Electrified Farms Using Electrically Powered Equipment*
Lighting	100
Milking machines	80
Water systems	60
Milk Cooler	50
TV Sets	40
Milk house heaters	20
Chick brooders	20
Barn cleaners	10
Silo unloaders	5
Pig brooders	2½

rather extensive experiments on "electroculture" of plants, conducted over a period of several years, and reported that they were unable to find any significant effects from any of the electrical treatments used. Other investigators, however, reported marked stimulation of plant growth under the influence of electrical fields or electrical discharges.

Too frequently, the experiments have been done by biologists with limited knowledge of the electrical phenomena they were dealing with or, conversely, by physicists or electrical engineers with too little understanding of basic plant physiology. As a consequence, many of the results reported can be dismissed as meaningless because adequate experimental controls were not imposed. The question of whether electrical forces can materially influence plant growth has not been answered, one way or the other. The problem is of sufficiently fundamental and practical importance to justify a joint effort on the part of competent electrical engineers and biologists to get a definitive answer.

Other studies have been made of the effect of radio-frequency energy, infrared energy, X-rays, thermoneutrons, cathode rays, gamma rays, and dielectric heating. These studies, in most cases, have been related to controlling insects or fungus growth in seeds and seed-handling equipment, and insects in harvested grain.

One notable example of this was reported recently in *Agricultural Research*. Preliminary studies indicate that treating seeds with low-frequency electrical discharges, under certain conditions, produces rather profound effects. Depending on the frequency and duration of this discharge and other factors, seeds of some plant species are stimulated to germinate faster and more uniformly. Seeds of other species so treated were severely damaged, or killed. Aside from the fact that the electrical discharge has any effect at all, the selectivity of the effect is one of the most intriguing aspects of the discovery. As the article implies, treatment of agricultural seeds with the proper amount and kind of electrical discharge may improve the germination of the crop seed and at the same time inhibit or destroy undesirable weed seeds. Practical application of this recent discovery may be some time away, but the potentialities are certainly obvious.

There are still wide areas in which little investigation has been done either to uncover possible uses and applications of such equipment or to develop practical methods of applying the principles already discovered. Perhaps one day in the future, the smudge pots used to keep fruit blossoms from freezing in the spring may give way to a high-frequency system in which the blossoms in question will be actually heated by electromagnetic radiation which envelopes the entire orchard.

Electric power may be used for more effective control of insects. In equipment such as this, the ultra-violet lamps attract the adults of many insect species.

Mechanical Power

The replacement of tractors by electrical power will probably become more feasible as the agricultural process becomes more concentrated, as higher production per unit of land is required, and with the possible added incentive of higher fuel costs for piston engines. Studies have been carried on to determine methods of using electric motors for such tasks as the preparation and cultivation of the soil. Some of these methods required complicated cable arrangements that might be useful on truck farms, but which are impractical for the larger areas. As the agricultural process becomes more concentrated, and as further studies are made, systems using electrical power to produce the desired seed bed conditions may become more economical and practical.

Controls

Farms at the present time are using many simple control devices. For example, the water system operates in response to an electric pressure switch, and the milk cooler operates in response to a thermal electric switch. In some instances, lights in a poultry house or greenhouse may be regulated by a photosensitive electric switch. In a few installations, a rain-sensitive

switch operates and closes windows in a poultry house. In incubators and some big storage rooms, humidity is controlled by an electric switch.

In the future, it is expected that more use will be made of program-type control on the farm. Such a system, for example, might find application in the poultry house by periodically operating a conveyor belt to fill feed hoppers, another to move eggs to the storage room, and another belt to move droppings to a collection bin. Thus, it may well be possible to provide nearly an automatic poultry plant in which one operator can care for a large number of birds. Automatic egg grading, washing, and most recently, semiautomatic candling equipment, completes the automation of the poultry industry. Such plants are in existence in a few areas and it is expected that more will be added. Similar types of program control may be possible in other farm operations, such as dairying, although attainment of such a high degree of automatic operation might be more difficult than in the poultry industry.

The previous discussion relating to the use of electricity on the farm of the future is based pretty much on modifications of operations similar to those we know at the present time. There have been predictions that a completely different type of agriculture, or rather food production method, may be developed based upon the growth of such materials as algae. Such methods have been proposed to help feed the populations in those parts of the world where primitive agricultural methods fail to provide adequate diets. The growth of algae would lend itself to semi-automatic production methods. The adoption of such systems would greatly expand possible uses of electricity and automatic methods in food production beyond those indicated by extrapolation of present production methods. Whether such changes actually occur depends upon a number of factors both political and economic, the answers to which are not known at the present time.

Computers

Previously, we have talked about the use of electricity directly in the process of producing plant or animal products and assisting the farmer by reducing the manual labor required. To attain the farm production necessary to feed a rapidly increasing population will require that electricity not only take over labor-saving tasks, but assist the farmer in the management of his operation as well.

More efficient production will require control or optimizing of as many variables in the production process as possible. For example, many operations could well afford to utilize data-taking units for reporting such information as the amount of sunshine or artificial radiation, the amount of moisture (natural or artificial), the air temperature, relative humidity, and data on other pertinent factors affecting crops. These could be fed into a computer along with information about such controllable variables as types and amounts of fertilizers applied and applications of weed and insect control chemicals. After processing the data, it should be possible to predict the date for the ripening of the crop, to determine the steps required to bring a crop to maturity at a desired date, and to estimate closely the volume of the harvest.

In the field of livestock, the computer would be even more useful in determining the relationship between rate of growth, rate of feed consumption, air temperature, market trends, and so forth, in order that the farmer might produce the maximum quality and quantity of food at a time which would give him maximum profits. A computer as an information storage and processing device would be quite useful, as well, in the area of production records and breeding control for poultry, dairy cattle, and other farm livestock. The larger breeding associations are already using information processing equipment of this type for the purpose of correlating breeding records with production records. Information processed by a machine on the individual farm might then be fed back to the central association providing artificial breeding services. One poultry breeder now dictates into a microphone information about each bird as he moves along the line of trap nests. The information is later transferred to punched cards for further processing.

As suggested at the beginning of this article, agriculture faces a serious challenge which concerns the whole body of citizens, not only the farmers themselves. The growing need for agricultural produce, which our swelling population will make critical, is coming in the face of a declining farm population and a dwindling agricultural area. While many factors will undoubtedly enter into the solving of problems that are certain to arise, one of the more significant factors will be the widening use of electricity.

The utilization of mobile-power, materials-handling, livestock-servicing, and other types of equipment is already changing the agricultural picture on many scattered farms. The mere expansion of the use of such available equipment will add considerably to our productive capacity. But the development and adoption of many techniques now in the experimental stage—such as methods for the control of the environment, equipment for program-type control of various operations, and computers—will bring a virtual electrical revolution in our system of agriculture.

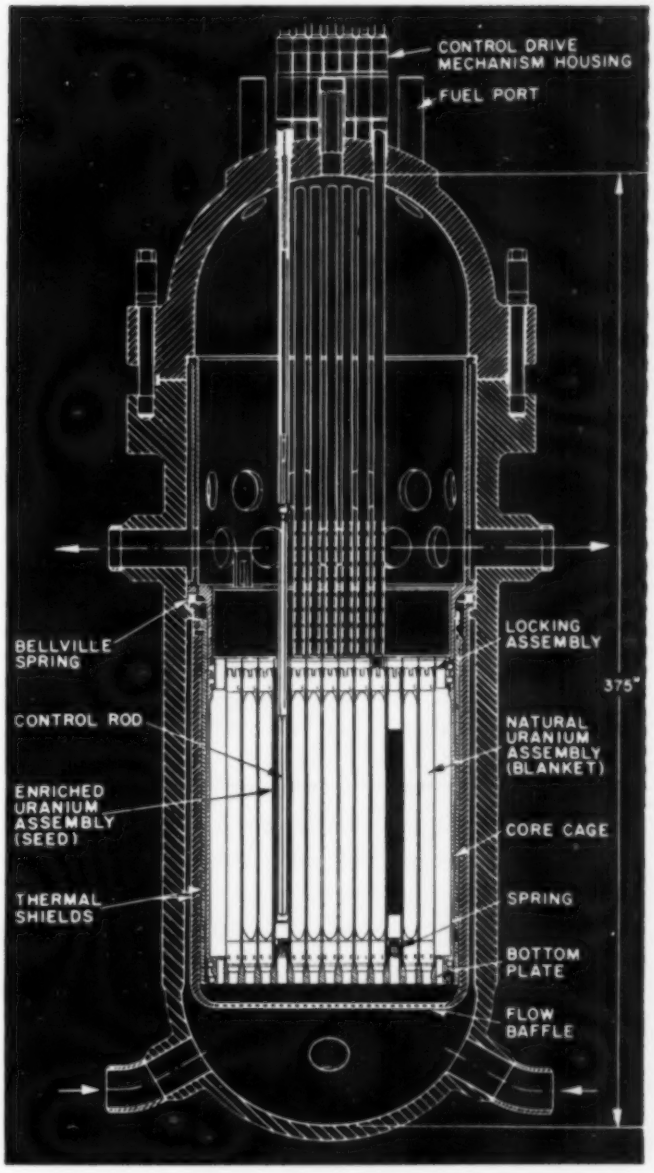
Economics of the Reactor Fuel Cycle

by HARLAN W. NELSON

Fuel charges are an important factor in the over-all cost of utilizing nuclear reactors for power generation. The author discusses the fuel cycle, giving attention to the principal items involved in determining the most economic cycle for a particular reactor system.

RECENT ADVANCES AND developments in the field of power generation by nuclear reactors make a consideration of the costs of such generation timely. The experience on which to base such consideration, while still limited, is now becoming available. We undertake here a general discussion of the factors involved in determining the economics of the use of nuclear fuel for power generation.

In a power reactor, we are concerned basically with the economic use of neutrons in a system involving fission. To achieve this economy, optimum factors involving design, materials, heat transfer, control, safety, and process systems must be selected and combined to give power output at minimum cost. Sociological and political considerations are also factors. We cannot, for example, overlook safety considerations for our fellow man, nor can we long use our resources of fissionable materials in systems which may offer the lowest immediate power cost, but which ignore the conservation aspects for a society in which future power demands are ever increasing.



Cross section of the PWR pressure vessel of the Shippingport reactor showing the core and control mechanisms. Height of the vessel is over 31 feet.

The cost of nuclear power is a function of capital charges, fuel costs, and operating expenses. In the present discussion we are interested in the economics of the fuel cycle, with, however, full appreciation that the basic features of design, safety features, and material properties are factors greatly influencing the cycle. The nuclear properties of the materials involved in the system together with their chemical and physical properties furnish the basis for the design of a system. The geometry and structural reality of the reactor system then becomes an engineering problem of evolution and development, with the economics of the system becoming apparent with progress and experience.

A summary of carefully estimated power costs for

the pressurized water (PWR) and Calder Hall type reactors are presented in the table given below. These are the reactors which so far have been developed to the greatest practical degree. The data are from the recently reported study of the American Radiator and Standard Sanitary Corporation, which considers the economics on the basis of second generation reactor systems. The relationship between fuel costs for the two types and capital charges for this country and Britain are clearly shown.

SUMMARY OF POWER COSTS FROM CALDER HALL AND PWR REACTOR TYPES, 90,000 Kw

	Mills per Kilowatt Hour			
	Calder Hall		*PWR*	
	In Britain	*In U.S.*	*In Britain*	*In U.S.*
Fuel costs				
Fuel rental	0.5	0.4	0.2	0.2
Fuel fabrication and reprocessing	1.6	1.6	7.5	7.5
U-235 burnup cost	1.4	1.4	2.0	2.0
Plutonium credit	(-1.4)	(-1.4)	(-0.5)	(-0.5)
Net	2.1	2.0	9.2	9.2
Capital charges	4.9	14.4	3.2	9.4
Site operating costs	1.0	1.5	0.7	1.0
Total	8.0	17.9	13.1	19.6

For either nuclear power plant, capital costs are of obvious importance. The matter of location of the plant exerts a strong influence on over-all costs, as shown by a comparison of the capital charges for building the same type of reactor plant in the two countries. Fuel costs in this comparison are greatly affected by the choice of reactor. The economics of the component items making up the fuel cycle will form the basis for the present discussion.

Reactor Fuel Cycles

From consideration of the variable factors involved in possible combinations of fertile and fissionable materials, moderators, coolants, levels of neutron energy and geometry for nuclear reactor systems, a wide choice of reactor types may appear to be possible. Actually, of the possible permutations, many can be removed from consideration on the basis of nuclear physics, and still others on practical engineering bases or materials incompatability. There remain a number of designs of reasonable technical feasibility. Research and development work in progress and scheduled for the immediate future is designed to pin down the efficiency and practicality of those systems. After a certain stage in this work, economics becomes a ruling consideration, since energy produced by nuclear means for civilian purposes must compete successfully with that derived from conventional sources.

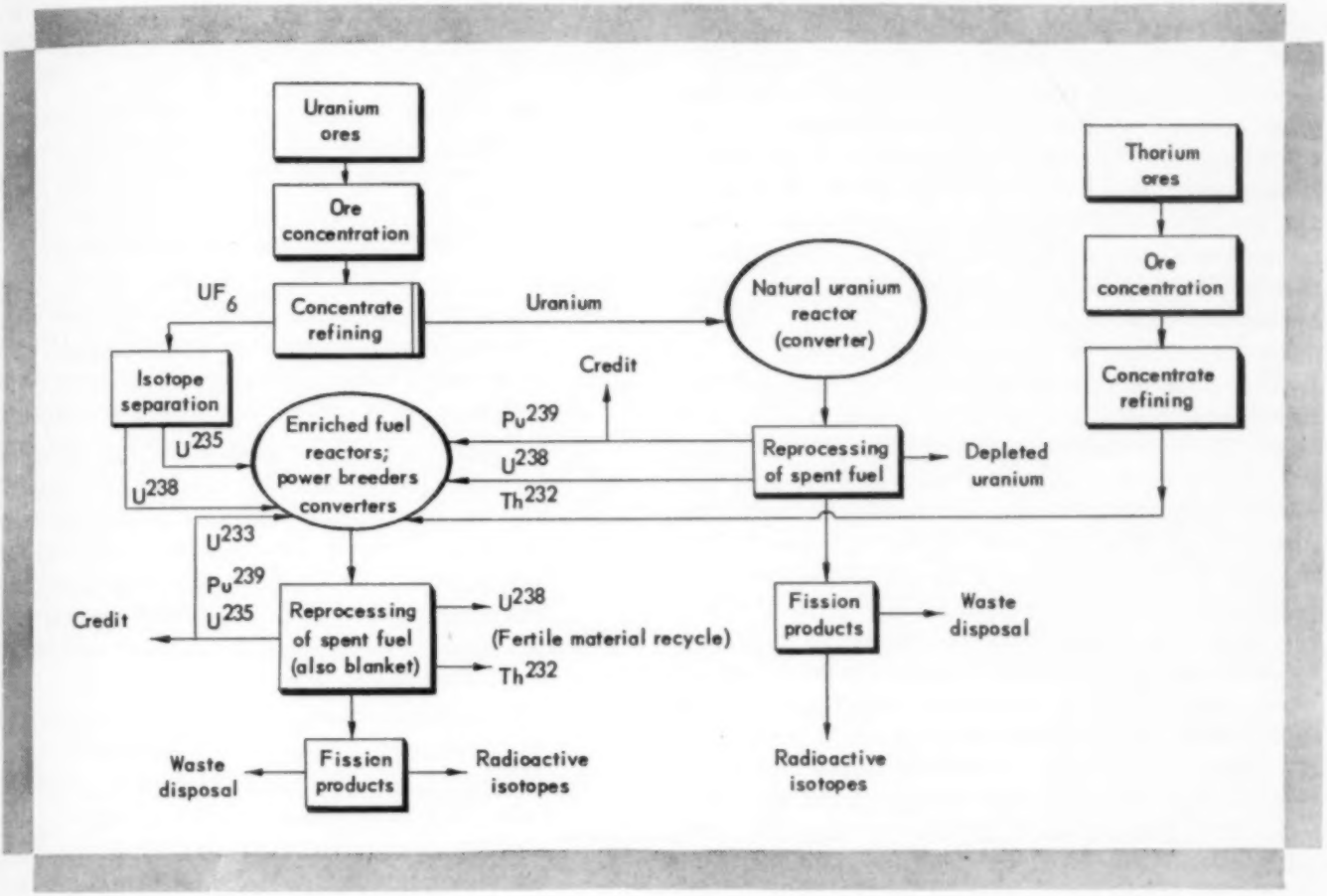
The chart on page 11 shows the principal elements of the fuel cycle for typical power reactors. The flow of materials, reprocessing steps and possible recycling steps are indicated. On an over-all basis, the successive steps considered in the cycle include:

1. Mining, concentration and refining of uranium and thorium ores.
2. Preparation of uranium and thorium of required properties.
3. Isotopic separation of U-235 and U-238 for systems using enriched fuels.
4. For heterogeneous reactors, the production of suitable structural and cladding materials for fuel elements.
5. Preparation, fabrication, and assembly of reactor fuels.
6. Burning the fuel in a reactor.
7. Reprocessing of spent fuels for removal of fission products and recovery of the fissionable materials U-235, U-233, and Pu-239, and the fertile materials U-238 and Th-232.
8. Processing of the radioactive waste materials; recovery of radioactive isotopes.
9. Waste disposal.

Needless to say, the technical feasibility and practicality of any nuclear reactor system must first be demonstrated. In addition, it is highly desirable at an early stage to make estimates of the economics of the system. These early approximations will serve to indicate the areas in which the system is deficient, the important interrelated factors, and the component areas subject to technical and economic improvement. In the final analysis, of course, the economics of a system can be put on a firm basis only when progress has been made to the point at which operating data on

Harlan Nelson currently directs economic studies of energy in its various forms and of applications of both conventional and nuclear fuels. During his years at Battelle, he has participated in and directed fuels studies on a broad front ranging from investigations of gas and oil residential heating equipment and the gasification of coal to the carbonization of coal and coal utilization. Before his association with Battelle, the author was professor in the department of fuels technology and directed fuels research at Pennsylvania State University.

FUEL CYCLES FOR NUCLEAR REACTORS



commercial-sized plants are available, including all items of the fuel cycle. We have not yet reached this stage of development, and reliably firm cost figures are yet to be obtained.

The principal items commonly considered to be involved in the nuclear fuel cycle costs include:

1. Fuel charges
2. Fuel processing
3. Inventory charges
4. Fabrication costs
5. Reprocessing costs
6. Credits for plutonium and depleted uranium
7. Waste disposal

When cost estimates are presented, the above items are sometimes shown in combined form. The inventory cost is related to the reactor design and operating schedule, and may be considered as fixed capital charge on the fuel cycle. Other variables affecting fuel cycle costs are involved in the method of operating the reactor. As shown in the chart above, operation may involve (1) recycling of both uranium and plutonium, (2) recycling one and selling the other, (3) operating without recycle and selling the uranium and plutonium, or (4) operating without recycle and discarding the materials discharged from the reactor.

The calculations involved in working out the characteristics of the elements of a fuel cycle are commonly expressed as dollars per unit weight of fuel. The items may be changed to a basis of mills per kwhr by dividing the costs per unit weight for fuel processing, fabrication, etc., by the electrical output in kwhr obtained per unit weight of fuel. The output figure is a function of the exposure level of the fuel (MWD per ton) and the plant efficiency percentage in converting heat to electrical power.

The cost of the fuel actually burned in the reactor is based on the schedule of charges set by the Atomic Energy Commission for natural uranium or fuel enriched to the required degree.

The enriched fuel supplied by the AEC is initially in the form of UF_6. The cost of transforming the fluoride to the oxide or the metal actually used in the fuel elements is in addition to the official scheduled charges and must be borne by the user whether the processing is done by the AEC or by a commercial facility. This is a small but significant item which may amount to several per cent of the total fuel cycle costs.

Inventory

The Government retains title for enriched uranium, and such fuel is only rented to the reactor operators at an interest rate of four per cent per year of the total value assessed by the AEC. Interest charges are in effect until the fuel material has gone through the separation plant and until the depleted uranium to be credited to the user has been converted to UF_6. The account of the user is then credited for the depleted material and for plutonium and is charged for the fuel burnup and losses that have occurred.

Direct purchase of enriched material may not be possible anywhere for some time in the future. However, when and if fissionable materials can be purchased outright on the open market, the purchaser will have to pay interest charges on the capital required to purchase the fuel. In case of purchase, the usual interest charges on borrowed capital will prevail, and charges now being assessed by the Government as rental will be raised by a factor of two or three. When this occurs, there will be greater incentive than ever to prove out on a practical basis those reactor designs which show low core inventories and low retention times for fabrication and reprocessing. In comparing the over-all economics of different reactor systems, the bases of charges for inventory must be similar.

Inventory charges are derived by dividing the capital invested in the inventory times the annual charges in per cent by the product of the full-capacity output, the plant load factor, and the number of hours operated per year. For non-amortized property, such as for capital tied up in fuel inventory, the annual percentage charges would be of the order of 12 per cent. Included would be capital charges of about 9-10 per cent, taxes of 2.0 per cent, and insurance charges of 0.2 per cent, or a total of about 12 per cent.

Fuel Fabrication

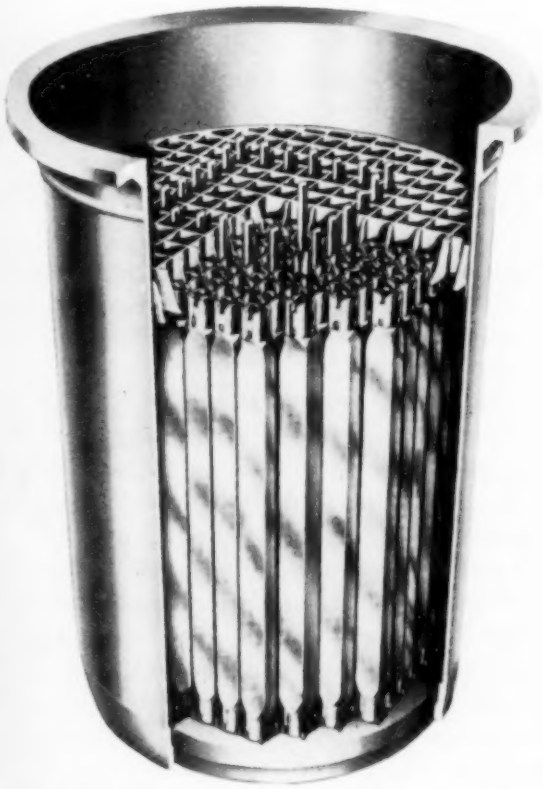
For heterogeneous power reactors fuel fabrication is an important cost item in the fuel cycle. Although costs remain high, considerable progress has been made in areas involving design, preparation of materials, and fabricating procedures. The response by industry to invitations to participate in this field has been prompt. Two years ago there were only a few private organizations active in this field. About a dozen firms are now engaged in this work and have the required facilities. Almost as many more have announced their entrance into this field in one capacity or another.

The chief factors affecting the costs of fuel element fabrication were outlined by T. T. Magel and B. S. Olds at the 1956 Conference of the Atomic Industrial Forum. Their outline serves well to indicate the principal items contributing to the over-all costs of this portion of the fuel cycle. The items are as follows:

1. *Research, development, and prototype costs.* Improved elements must be designed and tested, even while accepted fuel elements are in a limited production phase. Such research costs must be paid out in the production phase.
2. *Accountability and handling.* These costs represent several percentage points of the total costs of fuel elements. They may be decreased with improved planning, but may be increased if plutonium and U-233 must also be accounted for.
3. *Preparation of the fuel alloy.* Factors of criticality and reactivity involve high costs in this stage of fuel element manufacture. Analyses and tests occasioned by stringent chemical, corrosion, and metallurgical specifications are numerous and expensive. Experience in material preparation and improved specification materials will result in lowered costs.
4. *Fabrication.* There are two principal aspects of this stage of production. For essentially "cold" natural uranium or U-235 in metal or alloyed form, costs for a given design will drop as production volumes are increased. If recycled fuel containing plutonium, U-233, or fission products is to be used, special safe-handling or remote fabrication will be required, and another and largely unknown cost will be involved. The net cost to the complete reactor process will be based on a balance of the cost advantage of recycling fuel against the disadvantage in costs of remote handling and fabrication. Also of importance is the design of the fuel element, which involves the cost of materials involved and the degree of precision required in machining and other mechanical operations.
5. *Cladding.* This operation is usually necessary to prevent corrosion and to contain fission products. Low neutron-absorption materials are required, and many of these are in the category of the less familiar metals. However, the cost of zirconium and similar metals may be expected to decrease as production schedules are increased. Recovery from spent elements is not yet practicable; hence, the full cost is on the debit side. Optimizing the procedure for applying the cladding will also lower costs.
6. *Proving cladding integrity.* Any failures of the cladding within the reactor will be costly, so

integrity must be demonstrated beforehand beyond reasonable doubt. The development of foolproof claddings will minimize costs of improving integrity, but design changes and requirements of improved performance and higher operating temperatures will continue to present problems. Proving integrity of elements from recycled "hot" materials will require the development of new methods.

7. *Assembly.* Costs of assembly for "cold" elements will continue to decrease as production volumes are attained and optimum joining procedures are applied. If remote assembly is required, costs will be higher.
8. *Yield.* For expensive fissionable materials, it is essential to have high yields. Improvements will be achieved in this area as developments in the procedures discussed above are achieved.
9. *Size of production lots.* Because of criticality factors, small production lots will continue to limit gains to be achieved by increasing the volume production. However, as facilities are scheduled for repetitive runs, costs will decrease.
10. *Interest on fuel inventory.* With improved and faster production schedules and higher yields, inventory costs will approach a minimum.



Core of the Shippingport reactor. The control rods protrude from the highly enriched "seed" fuel elements. Other fuel elements are natural uranium blanket elements.

It is difficult to attempt to assign a cost valuation to the fuel fabrication portion of the fuel cycle. Some costs have been published, but details regarding bases for calculation are usually not given, and often the fabrication costs and reprocessing costs are lumped together. Most of the figures published are estimates, and, more often than not, are based on the more optimistic figures to be achieved with an assumed fixed element design and production volume. This tendency is reasonable, of course, since costs for any new development, process or machine, cannot be fairly expressed by prototype costs but must be predicted on a volume production basis.

In the table on page ten, the combined estimated costs of fabrication and processing were shown to be 7.5 mills per kwhr for a PWR-type reactor built in this country, based on second generation technology. This is based on an exposure level of 6000 MWD/ton of U. If this level were to be increased to 10,000 MWD/ton, the combined fabrication processing costs would be reduced to 5.6 mills per kwhr. This represents the effect of longer periods of power output between processing periods.

A factor of importance in costs of fuel elements of the PWR-type is the zirconium employed as cladding and structural material for both seed and blanket assemblies. Lower costs in this area will be possible when the costs of either zirconium sponge or of fabricated products, or of both, are reduced. The recent contracts for sponge at a price of about $6 per pound probably set the price level for several years. Increased industrial demand will serve to stimulate further price reductions, but improved processes of production, handling, and quality control will also be necessary. Improvements will be made in the yield of zirconium products from sponge, and improved fabrication techniques more nearly in line with other structural materials will be a factor in reducing over-all fuel-element fabrication costs. Authors of the American Standard Study estimate that with a substantial improvement in zirconium fabrication costs and expected reduction in zirconium raw materials costs, materials costs could be reduced to about 1.8 mills per kwhr at an exposure level of 10,000 MWD/ton. Modifications in fuel element design could reduce manufacturing costs of fuel elements to a level of about 0.7 mills per kwhr. The authors of the study conclude that a total materials and fabrication cost of about 2.5 mills per kwhr is the minimum cost for the foreseeable future based on current design for a fuel element of the PWR type.

Donald Kallman, of Babcock and Wilcox Company, has made a parametric study of some of the variables involved in the costs of fuel element fabrication. His object was to indicate how fabrication costs may vary

in the future when operating experience has been obtained and limits of radiation stability have been established. The study was based on a 250 MW (electric) pressurized-water reactor fueled with slightly enriched uranium oxide in rod form and clad with stainless steel. His procedure was to identify those parameters which can vary only within a narrow range and assign to them reasonable values, and then to explore the effect of other variables over a range of values. The three principal variables considered were the unit cost of heat transfer surface, the average heat flux, and the irradiation level.

For assigned and fixed values of power output, ratio of UO_2 radius in the element to the fuel rod radius, ratio of volume of fuel rods to the total reactor core volume, and UO_2 density, Kallman expressed the fabrication expense, in units of dollars per million Btu as:

$$\text{Fabrication expense} = \frac{0.43 \times 10\ C}{Q/A \times I}$$

where

C = heat transfer unit cost, dollars per sq ft
Q/A = average heat flux, Btu per hr per sq ft
I = irradiation level, MWD per ton

By use of this expression, the effect of the variables was evaluated qualitatively.

The inventory requirements for increased irradiation level were taken into consideration. Shown also was the economic balance between fabrication expense and inventory expense, which affects the selection of the diameter of the reactor cores and fuel rod dimensions. For example, for a 250 MW reactor, in which an irradiation level of 7,500 MWD per ton and an average heat flux of 100,000 Btu per hour per square foot is to be achieved, the fabrication expense is shown to vary inversely as the cube of the diameter of the reactor core. As the diameter of the reactor core is increased, the heat transfer surface can be made to serve for a longer period of time. This, however, is counterbalanced by fuel inventory costs for the extended time. For the example outlined, the total expenses contributed by inventory and fuel fabrication were shown to be a minimum for a reactor having a core diameter of from six to seven feet.

Reprocessing

Under the present status of development, the operation of a reactor must be interrupted after only a small number of the desired nuclear reactions have occurred. Consequently, to achieve full utilization of the fissionable or fertile materials, several cycles of the power-producing operations must be alternated with intervening steps of processing, recovery, purification, and waste elimination before a reasonably complete utilization of the fuel materials can be obtained. Such reprocessing is necessary for several reasons: (1) to rework the fuel elements in which structural and heat transfer properties have deteriorated during burnup, (2) to add makeup fissionable material, (3) to remove poisons and waste products, and (4) to recover fissionable fuel bred in the reactor.

The complexity of the process and resulting costs are related to the type of fuel, the alloying materials, the kind of cladding, and the geometry of the reactor. The process selected must furnish high yields, since the materials involved are expensive. The over-all reprocessing operation must be accomplished as rapidly as possible so as to keep to a minimum the retention time and thus the inventory charges associated with the use of high-value materials. Losses must be kept low, particularly if a number of cycles are required to obtain an economic degree of fuel utilization. If remote fabrication of fuel elements is practicable, a lower degree of removal of fission products would be acceptable. This would also be true for homogeneous reactors. If fabrication is to be done with direct handling, decontamination must be brought down to a safe level. Although not done at present, it would be desirable also to recover cladding materials, such as zirconium, because of their relatively high cost.

The combined factors relating to fuel reprocessing result in a costly cycle. Operation of a plant for processing radioactive materials is expensive. Some time ago, the AEC estimated the difference in costs between a plant processing a radioactive material and one which performed the same service but with ordinary materials. These estimates concluded that construction costs for the radioactive plant would be 12 times that of the comparable nonreactive plant, and that operating costs would be almost three times as much.

At present, the solvent extraction method of reprocessing is being used. Other possible methods under investigation include chemical separation by precipitation, ion exchange, distillation based on volatility, and pyrometallurgical processes.

The costs of reprocessing are closely related to the daily or yearly volume of the fuel materials involved. Although high costs of containing and transporting radioactive waste materials would appear to favor processing at or near the reactor site, it seems evident that economic processing can be achieved only on a larger scale. The reprocessing plant would thus perform a service function for a number of reactors in a given area. Studies have indicated that the unit

processing costs for spent fuels from a reactor capacity of 1000 MW are three times those for a total reactor capacity of 20,000 MW. Another study has shown that reprocessing costs are reduced by a factor of 8 in going from a plant having a throughput of 220 lb of uranium per day to one of nine tons per day.

At the Chalk River Project, in Canada, H. K. Rae and his coworkers have published detailed calculations of processing costs for various modifications of fuel recycling. The reactor under consideration is a heavy-water system fueled with natural uranium or UO_2, with recovery and recycling of plutonium, and an output of 100 electrical MW per reactor. They found that the minimum cost of recycling is approached only at a scale of operation involving 10 reactors, which involves about 1200 pounds of uranium and four kilograms of plutonium per day. Using uranium oxide and plutonium-aluminum alloy as fuel, with two plutonium recycles, the processing cost for recycling was estimated to be 1.5 mills per kwhr. Fabrication costs are included, but not the cost of the uranium feed. Fabrication costs were found to be more than half of the total cost of recycling.

Reprocessing of spent fuel has not yet been accepted as a business venture by private industry. Until the volume of reprocessing activity reaches a level sufficient to attract participation by industry, the AEC has announced its willingness to perform this service. Early this year, the AEC announced a charge of $15,300 per day for use of its reprocessing facilities. Basis for the charge is an assumed plant with a capital investment of $20,570,000, having a capacity of one ton per day of natural or slightly enriched uranium. The charges assume a yearly capacity of 300 tons and include waste disposal but not transportation.

EURATOM POWER COST ESTIMATES

	Mills per Kilowatt Hour		
	PWR	*BWR*	*Calder Type*
Fuel costs:			
Uranium in fresh fuel	5.8	2.1	2.0
Fuel fabrication	1.1	1.7	0.4
Chemical reprocessing	0.4	0.3	0.3
Plutonium credit	-0.9	-0.8	-1.0
Uranium credit	-3.7	(-0.3)	(-0.3)
Net fuel cost	2.7 (24%)	3.3 (31%)	1.7 (16%)
Other operating costs	1.0 (9%)	1.0 (10%)	1.0 (9%)
Fuel inventory charges	1.3 (11%)	0.8 (8%)	0.7 (7%)
Capital charges	6.3 (56%)	5.4 (51%)	7.4 (68%)
Total cost of electricity	11.3	10.5	10.8
Total plus 25% contingency	14.1	13.1	13.6
Cost Range	11.3-14.1	10.5-13.1	10.8-13.6

Credits for Plutonium and Depleted Uranium

For enriched systems of low or moderate burnup the unburned U-235 is credited after the spent fuel is reprocessed. For natural uranium systems, the credit may or may not be applied. Plutonium or bred U-233 would also be credited to the fuel cycle charges. As a final objective, the breeder reactor would furnish the ultimate in credit, with the net cost of fuel consumed approaching zero.

The unit value of plutonium bred in a reactor is currently established by the Government. The value of $12 per gram has recently been raised to $30-$45 per gram for a specified schedule of years. Ultimately, the price of plutonium will be based on its value as a fuel, which probably will be lower than the presently assigned value.

Waste Disposal

The disposal of fission wastes is a factor of great physiological and sociological significance in connection with a nuclear power program. It is also a not insignificant factor in the economics of the fuel cycle.

H. R. Zeitlin and his coworkers have recently discussed the economics of waste disposal. They believe that waste disposal costs should be held to a figure of about one per cent of the over-all costs of electricity from a power reactor. If this would be a reactor producing power at the bus bar at a cost of 8 mills per kwhr, waste disposal costs should be less than 0.1 mill. They consider costs of storage, cooling, shielding for shipment, and transportation, and show some of the relationships of these costs with the degree of activity of the wastes. In the studies at Chalk River, the cost of waste disposal was found to be equivalent to 0.12 mills per kwhr for a plant capacity of 200 MW and 0.06 mills per kwhr for a total capacity of 1000 MW. Factors affecting the cost of waste disposal include the type of fuel element and cladding, method of processing, and the degree of enrichment and burnup.

The costs of waste disposal are included under the schedule of prices for reprocessing by the AEC.

Over-All Power Costs

As an example of calculated costs of power producing reactors, the comparative data in the table on page

15 are presented. These are the cost figures prepared recently in connection with the report of the "Euratom" study committee. This particular comparison is used because it concerns reactors which to date have reached the highest state of development, and comparable economic bases were used for all three reactors. Many other cost calculations are available for other types of reactors, but since the purpose of this discussion is general, no attempt will be made to cover the field of reactor design factors. Actual values for interest charges, construction costs are considered to be average for the countries involved, and are not typical for this country.

Note that the net fuel costs vary by a factor of almost 100 per cent for the boiling water reactor and the Calder Hall unit. Note also that the over-all energy costs for the three reactor systems do not vary by more than eight per cent—much less than the 25 per cent contingency factor. As is often the case, the plant with low fuel costs is counterbalanced by higher capital charges. One of our problems is to prove out a reactor design that not only is economical on fuel costs, such as a breeder might be, but also shows conservative capital costs for equipment, buildings, and inventory.

In summary, to reach an economic level for producing nuclear power, the following factors must be optimized:

1. Cost of fuel. Achieved by improved mining, refining, and processing procedures.
2. Burnup in the reactor. If the burnup is increased, processing and fabricating costs can be decreased in nearly direct proportion.
3. Breeding rate. Better utilization will decrease fuel costs.
4. Improved fuel composition and fabrication methods.
5. Improved processing techniques.
6. Improved and more economical means of waste disposal.
7. Optimum utilization of possible credits from useful fission products.

Perhaps more than anything else, the economics of the fuel cycle is concerned with optimizing the selection and application of materials. Nuclear characteristics of materials are fixed properties. With these factors as a starting point, selection must be made on such bases as corrosion resistance, radiation damage, temperature behavior, availability and cost. What appears good to the designer might be gall to the economist and the processor. Compromises will be the rule until the optimum possibilities are proven in practice.

WHITNEY'S SYSTEM OF MANUFACTURE

"(Eli) Whitney's system of manufacture was the result of careful analysis. It required breaking into its constituent parts the article he wished to produce and then devising a series of machines to turn out each component accurately . . .

"'Instead of relying upon one great complicated machine, wherein one small part being out of order or not answering to the purpose expected, the whole must stop and be rendered useless,' he developed separate processes for each individual component (of a musket). Cutting, grinding, boring, he suited the machine to the piece it must fashion . . . 'One of my primary objects,' he wrote, 'is to form the tools so that tools themselves shall fashion the work and give to every part its just proportion—which when once accomplished, will give expedition, uniformity, and exactness to the whole.'"

Constance McL. Green, *Eli Whitney and the Birth of American Technology*

NOTES from BATTELLE

LEATHER-FINISH ADHESIVES

Battelle leather chemists have found new bonding resins that are suitable for leather-finish adhesion evaluations. In a paper presented at the recent Annual Meeting of the American Leather Chemists Association, Victor G. Vely, Nicholas D. Gallagher, and Maynard B. Neher reported the discovery of the applicability of a cold-set and two hot-set resins during a study supported by the Tanners' Council of America.

The epoxy cold-set resin was found to adhere well to most shoe upper-leather finishes at room temperatures. The chemists found not only that it minimizes temperature effects, but that it also gives more realistic values for some finishes.

The heat-set resins are best suited to control purposes because sample preparation times are short. One, a mixture of polyamide resins, adheres to practically all shoe upper-leather finishes and represents a distinct advance over the phenolic adhesive used previously. The other, a vinyl chloride copolymer, adheres well to vinyl- and lacquer-finished upholstery leathers. Together, the three resins cover the complete spectrum of contemporary leather finishes.

DEFORMATION OF METALS

In a new approach to the study of deformation of metals, scientists at Battelle are attempting to correlate variations in electrical properties with structural changes in semiconductors. This study, sponsored by the Office of Naval Research, is aimed at creating a better basic understanding of the structural changes in engineering metals when they are deformed and annealed.

It has been found that the intermetallic semiconductor, indium antimonide, exhibits metallic behavior when subjected to various mechanical forces. The electrical properties of this semiconductor undergo extreme changes when defects are introduced into its crystal structure. By comparison, the electrical properties of ordinary metals change relatively little under similar conditions. This remarkable sensitivity to introduced defects enable Battelle investigators to gain a better understanding of the behavior of such defects in common engineering metals.

In current experiments, indium antimonide is plastically deformed at about 200 C, and then its electrical properties are measured at —190 C, where the effects of structural changes are most readily observed.

By correlating metallographic observations of the introduction and movement of defects with corresponding electrical changes in this semiconductor, R. E. Maringer and J. J. Duga of Battelle hope to learn more about the fundamental processes that eventually lead to plastic deformation and fracture of metals.

Indium antimonide was chosen for this research because it has the largest electron mobility known for any material and because it deforms plastically at relatively low temperatures.

SEMICONDUCTOR IRRADIATION

Advances made in the design of weapons and weapon systems have created a need for a more detailed knowledge of the properties of all kinds of materials. This is particularly true of solid-state electronic devices that may be called on to operate at high ambient temperatures and in strong fields of radiation, such as those in the vicinity of nuclear blasts or near nuclear power plants in aircraft, guided missiles, ships or submarines.

Basic experimental and theoretical research to explain the effects of radiation damage on semiconducting materials is now in progress at Battelle, under a contract with the Air Research and Development Command's Wright Air Development Center.

Knowledge of the mechanism of radiation damage will aid in determining which semiconducting materials can be used for the fabrication of electronic components to function best in relatively intense radiation fields and which will continue to operate under prolonged irradiation.

Some of the semiconducting materials to be studied in this program at Battelle's one-megawatt research reactor are aluminum antimonide, gallium arsenide, indium phosphide, cadmium sulfide, and cadmium telluride.

In the course of their research, Battelle scientists under the direction of R. K. Willardson will study the

effects of neutron and gamma radiation on the semiconductors. The effects of fast neutrons will be investigated because of the profound disruptions they produce in crystal lattices. Slow neutrons lead to atomic transmutations. Gamma radiation can also induce chemical and electrical effects that might interfere with device operation.

* CAR INCINERATOR STUDY

A continuing problem for members of the car-wrecking and iron and steel scrap industries is that of preparing automobiles for scrap purposes. Since this involves removal of nonmetal materials, the usual and most economical method appears to be combustion. However, since most concerns involved in the industry are small and are located in cities, the requirements for car burning incinerators are rather stringent.

1. Equipment and operational costs must be kept low so that small concerns can afford the equipment.
2. Incinerators should be capable of handling whole cars, as well as parts, with the greatest possible ease.
3. They should be nuisance free with respect to noise, dust, smoke, and odors.

In a study for the Balers Committee of the Institute of Scrap Iron and Steel, technologists at Battelle designed an incinerator to meet the requirements. Institute staff members, Richard B. Engdahl and Richard D. Ellsworth, who, with their colleagues, participated in the development, recently described the design. Basically, the incinerator would be a simple steel box supplied with air and connected to an afterburner and exhaust stack. The steel walls would serve to contain the gases and provide a means for their efficient mixing and combustion with air. At the same time, because of the large excess of air contemplated, the metal on the car would not be overheated.

* LARGER URANIUM MELTS

In order to control the reactivity of uranium to various gases, the metal is melted normally in vacuum furnaces. Metallurgists have long recognized that melting uranium in larger amounts would have definite advantages. Among these would be the possibility of manufacturing larger numbers of bars of similar composition; greater ease of blending scrap into the charge; and, of course, lower melting costs.

A method which appears to be feasible for melting up to ten tons of uranium in open furnaces has been developed at Battelle for the Atomic Energy Commission. According to Institute technologists, George W. P. Rengstorff and Harold W. Lownie, Jr., they and their colleagues have succeeded in producing ingots of 1200 pounds. They report that the average recovery of uranium from the ingots was 91 to 95 per cent. Though not quite so pure as vacuum-melted ingots, the average carbon content was 0.04 per cent by weight and the average nitrogen content about 0.01 per cent.

The ingots were produced by melting uranium in high-frequency induction furnaces under a blanket of argon. The molten metal poured quietly under a cover of molten barium chloride or calcium chloride which served to keep oxidation low.

Uranium's density, 18.7, makes it about two-and-one-half times as heavy as iron. Because of its weight, ten tons of the metal can be melted in equipment capable of melting four tons of steel. Since uranium's melting point, 2065 F, is about that of cast iron, standard furnaces could be utilized for the larger uranium melts.

* NEW APPOINTMENTS

Bertrand A. Landry, assistant technical director — joined Battelle staff in 1941 — known for his work in fuels technology. Until recently in charge of Paris office.

Richard J. Lund, assistant technical director—geologist and mineral economist, member of battelle staff since 1945.

David D. Moore, manager of department of economics—chemical engineer and economist, affiliated with Battelle since 1948.

* Numerous laboratories are utilizing cobalt-60 sources to supplement 250-kvp X-ray machines for making radiographs of materials with thicknesses and densities beyond the capabilities of the latter machines.

In a paper presented before the recent "Symposium on Nondestructive Testing in the Nuclear Energy Field" Merle Rhoten of Battelle suggested that cesium-137 may be utilized as a radiation source to further supplement the small X-ray machine. He pointed out that the .661 Mev gamma emitted by cesium-137 fills the large void between the wavelengths of the 250-kvp X-ray machine and a cobalt-60 source.

Writings by STAFF Members

American Society for Mechanical Engineers, Transactions, July, 1957, contains the following articles by staff members:

The Application of a New Structural Index to Compare Titanium Alloys with Other Materials in Airframe Structures. L. R. Jackson and S. A. Gordon, pp. 949-958.

A new structural index is compared with the results of compression tests on aluminum sections at room temperature, and similar tests on titanium-alloy angles and channels at room and elevated temperatures. It is believed that the new structural index will provide a reliable method of evaluating the elevated-temperature performance of materials such as titanium, in comparison with other materials, when only the compressive stress-strain curves are available at each temperature.

Force Relationships in the Machining of Low-Carbon Steels of Different Sulphur Contents. F. W. Boulger, H. E. Hartner, W. T. Lankford, and T. M. Garvey, pp. 1155-1164.

Tests on steels with 0.025 to 0.25 per cent S content in constant-pressure and conventional lathes showed that S addition reduced the forces acting on the tool for equivalent feeds. This effect results from decreased friction between chip and tool and from an accompanying reduction in strain during chip formation.

American Society for Testing Materials, Proceedings, v. LVI. 1956, contains the following articles by staff members:

Effects of Geometry on the Properties of C4A-T6 and SG 60A-T6 Aluminum-Alloy Castings. W. H. Johnson and H. F. Bishop, pp. 724-737.

Tensile properties were determined at various locations in castings of different thicknesses and geometries and compared with properties obtained from separately cast test bars. It is shown that special molding and melting processes may be used to develop properties in castings which approach or exceed test bar properties.

The Effects of Strain Rate and Temperature on the Stress-Strain Relations of Deep-Drawing Steel. R. J. MacDonald, R. L. Carlson, and W. T. Lankford, pp. 704-723.

The effects produced by a range of strain rates (0.002 to 0.8 inch per inch per second) and temperatures (75 F to 300 F) on the stress-strain properties of fully aluminum-killed temper-rolled steel were studied. Variations of these values markedly affect yield point phenomena and work-hardening characteristics.

Members of the Battelle staff are authors of the recently published articles and books listed on this page. In most cases, reprints are available from the Battelle Publications Office, 505 King Avenue, Columbus 1, Ohio.

Proceedings of the Joint Conference on Combustion. Institution of Mechanical Engineers. 1955, contains the following articles by staff members:

Coal Firing for the Open-Cycle Gas Turbine: A Comparison of Methods. Herbert R. Hazard, pp. 340-346.

The economical and operational considerations on which choice of a firing method must be based depend largely on control characteristics of the turbine and firing equipment, dust loading of the gas supplied to the turbine, cycle losses and auxiliary power requirements, and mechanical reliability.

An Appraisal of Combustion Research. Ralph A. Sherman and William T. Reid, pp. 7-13.

Research in combustion of both solid and liquid fuels is reviewed with the objective of appraising its effect on today's practice in the utilization of fuels. The relatively minor role of fundamental research in recent advances indicates that improved understanding is needed between the research worker and the engineer who must apply the results of research.

Linear Programming Isn't Always the Answer. David E. Debeau. *Operations Research Society of America, Journal,* v. 5, June 1957, pp. 429-433.

Linear programming has been frequently applied to the problem of finding the best mix of raw material for a particular selection of products. In applications of this type where one or more of the raw materials is nonuniform, application of linear programming can increase the cost of operation. Calculation of charge for a metal melting furnace is discussed as an example.

Magnesium and Its Alloys. M. W. Mote and R. J. Jackson. *Materials in Design Engineering,* v. 46, July 1957, pp. 115-134.

An up-to-date 20-page manual on the properties, fabrication, and uses of the magnesium alloys now commercially available.

Semiconductor Abstracts. E. Paskell, Editor. v. III. 322 pp. 1957. John Wiley & Sons, Inc., New York.

Abstracts of the 1955 literature on semiconducting and luminescent materials and their applications. Statements of important results are included.

Titanium Extrusions. A. M. Sabroff and P. D. Frost. *Modern Metals,* v. 13, July 1957, p. 52 + 5 pages.

Summarizes available information concerning heat-treatment, die design, extrusion practice, post-extrusion processing, and mechanical properties.

Our Expanding Economy. Clyde Williams. *Analysts Journal,* v. 13, June 1957, pp. 80-85.

Technology and research represent one of the primary reasons for the current strength in our economic growth pattern and the recent tremendous advance and diversification of industry. The scientists and engineers produced by our colleges have made possible the rapid growth of research and have helped management make use of these advancements. Our technology-based economy distributes its benefits to all of the people. The growth pattern of a product is related to research, population growth, and gross national product. Forward steps on the technological front will be supplemented by important social and political actions that will give impetus to economic progress.

Research by Contract at the Battelle Institute. **Vertragsforschung im Battelle-Institut.** H. Gwosdz. Paper from "Arbeitsgemeinschaft der technisch-wissenschaftlichen Bibliotheken. Bericht über die 6. Tagung in Frankfurt (Main) Grosses Auditorium des Battelle-Instituts am 14. und 15. März 1956". Arbeitsgemeinschaft der Technisch-Wissenschaftlichen Bibliotheken, 1956, pp. 9-16.

After reviewing the origin and history of the Battelle Memorial Institute in the United States, the author describes the establishment and organization of the Frankfurt installation, discusses the types of clients who come to Battelle with research problems and the need for keeping research results confidential, for the use of the sponsor only. He concludes with a discussion of contractual arrangements and the relationship between the sponsor and the Institute.

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***Asterisks mark items that may be used in the Battelle Library only. None of the unbound materials listed below are available for interlibrary loan.**

AERONAUTICAL ENGINEERING

14014 Nonlinear Response of Aircraft Panels in Acoustic Noise. E. J. Kirchman and J. E. Greenspon. *Acoustical Society of America, Journal*, v. 29, July 1957, p. 854-857.

Response of thin elastic plates to sinusoidal acoustic excitation; a theoretical method for obtaining the dynamic deflection and stress in the nonlinear region.

14015 Britain's Guided Weapon Industry. F. T. Meacock. *Aeroplane*, v. 92, June 28, 1957, p. 908-917.

A review of developments in major British missile manufacturing companies.

14016 Project Vanguard. James Strong. *Aeroplane*, v. 92, June 28, 1957, p. 919-932.

The IGY program, Vanguard vehicle, earth satellite design, ascent into space, tracking the satellite, and research in space are discussed.

14017 Practical Structural Design Problems of Supersonic Aircraft. W. G. Heath and B. O. Heath. *Aircraft Engineering*, v. 29, July 1957, p. 206-211.

Determination of critical design case; practical considerations in the choice of material and structure; stressing and aeroelastic considerations; structural testing.

14018 Stress in a Curved Skin Panel of a Pressurized Fuselage. J. Lockwood Taylor. *Aircraft Engineering*, v. 29, July 1957, p. 216-218.

Analysis of the problem of an initially curved circumferential skin strip representing a section of the panel midway between frames, continuous over the stringers which act as sinking supports and transfer part of the internal pressure load to the frames.

14019 Integral Skins. *Aircraft Production*, v. 19, July 1957, p. 260-272.

Production techniques and equipment used in the manufacture of large wing-panels.

14020 The Effects of Liquefaction of Air on the Pressure Distribution and Forces on a Cone-Cylinder Body at M=5.0. W. T. Strike and W. N. MacDermott. *Arnold Engineering Development Center*, AEDC-TN-57-14, June 1957, 44 p. (TL501 Ar64tn Contin.)

14021 Thermostructural Efficiencies of Compression Elements and Materials. George Gerard. *ASME, Transactions*, v. 79, July 1957, p. 967-973.

Minimum-weight equations are presented in terms of structural loading and material-efficiency parameters. Typical results are presented for composite structures and some general considerations are presented for selection of materials for thermal-flight aircraft.

14022 Weight-Efficiency Analysis of Thin-Wing Construction. R. A. Anderson. *ASME, Transactions*, v. 79, July 1957, p. 974-979.

The effects of corrugated-web systems and steel-sandwich cover skins on weight efficiency are analyzed, and simple criteria are given for estimating the effect on weight of changes in the material properties of the structure.

14023 Design Criteria for Heated Aircraft Structures. Robert Goldin. *ASME, Transactions*, v. 79, July 1957, p. 980-985.

Engineering considerations which constitute structural criteria are briefly reviewed, and the use of a "safety factor" in the "working-stress" approach is compared with its use in the "limit-load" design concept.

14024 Discussion on Safety-Factor Requirements for Supersonic Aircraft Structures. G. M. Goldman. *ASME, Transactions*, v. 79, July 1957, p. 986-989.

Safety-factor aspects of design; new problems caused by the advent of heated aircraft structures; procedure necessary to provide adequate safety reserves.

14025 Some Structural Penalties Associated With Thermal Flight. J. W. Mar and L. A. Schmit. *ASME, Transactions*, v. 79, July 1957, p. 990-1004.

This paper investigates the short-time static strength of the structure as it is subjected to the combined action of maneuvering loads and internal heat flow.

14026 Aircraft Structural Testing Techniques at Elevated Temperatures. R. C. Brouns and R. B. Baird. *ASME, Transactions*, v. 79, July 1957, p. 1005-1013.

Test-system requirements and problems associated with structural testing of aircraft at elevated temperatures.

14027 Some NACA Research on Effect of Transient Heating on Aircraft Structures. J. E. Duberg. *ASME, Transactions*, v. 79, July 1957, p. 1014-1018.

Description of radiant-heating apparatus developed to simulate aerodynamic heating of aircraft structures.

14028 Description and Prediction of Human Response to Aircraft Thermal Environments. Craig L. Taylor. *ASME, Transactions*, v. 79, July 1957, p. 1024-1028.

To obtain the highest combined fitness of man and aircraft it is necessary to abandon the time-honored concept that human thermal comfort must be assured, and to substitute the principle of maintaining the physiological and performance effectiveness of the crew for the limited period of the particular flight duration.

14029* Space Dynamics Technique Hinges on Propulsion Systems. John DeNike, Jorgen Jensen, and Michael Stoiko. *Aviation Age*, v. 28, July 1957, p. 26-31.

Three-step method of space travel will prevail as long as we are restricted to powerplants that can be built in near future. Classic three-step scheme can be refined and simplified.

14030 Simulated-Flight Engine-Test Facility at N.G.T.E. II. The Engine-Test Problem. R. P. Probert. *Engineering*, v. 183, June 28, 1957, p. 814-820.

Describes the actual engine-test installations now built or under construction.

14031 First Annual Guided Missile Encyclopedia. *Missiles and Rockets*, v. 11, July 1957, p. 123-164.

Data on the U. S. Army, Navy, and Air Force missiles.

14032 Design and Construction of Wind Tunnel Models. Joseph J. Muncey and David M. Pote. *North Atlantic Treaty Organization, Advisory Group for Aeronautical Research and Development Report* 20, Feb. 1956, 20 p. (TL565 Ag11r Contin.)

14033 Some Results of Comparison of Model and Full Scale Spinning Tests. A. J. Marx. *North Atlantic Treaty Organization, Advisory Group for Aeronautical Research and Development Report* 26, Feb. 1956, 9 p. (TL565 Ag11r Contin.)

Comparison of wind tunnel and full-scale spinning tests for the Fokker S-11 primary trainer.

14034 Notes on Correlation of Model and Full-Scale Spin and Recovery Characteristics. Melvin N. Gough. *North Atlantic Treaty Organization, Advisory Group for Aeronautical Research and Development Report* 27, Feb. 1956, 20 p. (TL565 Ag11r Contin.)

14035 "Dead Stick" Landing Testing Techniques. Alen R. Holcombe. *North Atlantic Treaty Organization, Advisory Group for Aeronautical Research and Development Report* 28, Feb. 1956, 10 p. (TL565 Ag11r Contin.)

Information gained during U. S. Navy experiments with dead-stick landings on ten different jet aircraft. Testing methods, glide range determination, and landing techniques.

14036 The Theoretical Determination of Normal Modes and Frequencies of Vibration. I. T. Minhinnick. *North Atlantic Treaty Organization, Advisory Group for Aeronautical Research and Development Report* 36, Apr. 1956, 47 p. (TL565 Ag11r Contin.)

The various methods that have been devised for determining the natural frequencies and normal modes of aircraft are discussed.

14037 Recent Research on the Determination of Natural Modes and Frequencies of Aircraft Wing Structures. John M. Hedgepeth. *North Atlantic Treaty Organization, Advisory Group for Aeronautical Research and Development Report* 37, Apr. 1956, 24 p. (TL565 Ag11r Contin.)

Importance of various secondary effects on box-beam vibration. Analytical methods for the delta wing.

14038 Philosophy of Airworthiness. W. Tye. *North Atlantic Treaty Organization, Advisory Group for Aeronautical Research and Development Report* 58, Aug. 1956, 14 p. (TL565 Ag11r Contin.)

Airworthiness in relation to external circumstances; level of safety; the accident rate and accident probability approaches to airworthiness; structural requirements in the light of these considerations.

14039 Factors Affecting the Field Length of STOL Aircraft. G. W. Johnston. *North Atlantic Treaty Organization, Advisory Group for Aeronautical Research and Development Report* 81, Aug. 1956, 15 p. (TL565 Ag11r Contin.)

14040 A Study Toward a System of Classification of Unprepared Landing Areas. W. Gordon Duncan. *North Atlantic Treaty Organization, Advisory Group for Aeronautical Research and Development Report* 89, Aug. 1956, 6 p. (TL565 Ag11r Contin.)

System consists of two major parts: classification of terrain types by size, slope, and configuration; and classification of surface conditions by surface roughness and sheer strength of the soil.

14041 Let's Consider Ramjet-Turbojet Combinations for Supersonic Flight. R. T. DeVault. *SAE Journal*, v. 65, July 1957, p. 35-38.

Combination promises over-all efficiency.

14042 Contributions on the Mechanics of Boundary-Layer Transition. G. B. Schubauer and P. S. Klebanoff. *U. S. National Advisory Committee for Aeronautics, Report* 1289, 1956, 11 p. (TL521 Un3r Vis.)

The manner in which flow in a boundary layer becomes turbulent was investigated on a flat plate at wind speeds generally below 100 ft. per sec., using hot-wire techniques.

14043 A Low-Speed Experimental Investigation of the Effect of a Sandpaper Type of Roughness on Boundary-Layer Transition. Albert E. von Doenhoff and Elmer A. Horton. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3858, Oct. 1956, 45 p. (TL570 Un3t)

The occurrence of transition could be correlated on the basis of a local roughness Reynolds number based on the size of the roughness and the velocity at the top of the roughness. The extent of the roughened area does not affect the critical value of the roughness Reynolds number.

14044 Theoretical and Experimental Investigations of Delta-Wing Vibrations. Edwin T. Kruszewski, Eldon E. Kordes, and Deene J. Weidman. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4015, June 1957, 11 p. (TL570 Un3t)

Nodal-line patterns and frequencies of a 45° built-up thin-skin delta-wing specimen obtained experimentally are compared with those calculated by two analytical methods. Data for a 60° thickness specimen is also shown.

14045 Investigation at Low Speeds of Deflectors and Spoilers as Gust Alleviators on a Model of the Bell X-5 Airplane With 35° Swept Wings and on a High-Aspect-Ratio 35° Swept-Wing-Fuselage Model. Delwin R. Croom and Jarrett K. Huffman. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4057, June 1957, 37 p. (TL570 Un3t)

Deflector and spoiler-deflector types of controls can be designed to provide considerable gust alleviation for a swept-wing airplane while still maintaining stability and control.

14046 Studies of Structural Failure Due to Acoustic Loading. Robert W. Hess, Robert W. Fralich, and Harvey H. Hubbard. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4050, July 1957, 11 p. (TL570 Un3t)

Comparisons are given for results of fatigue tests of flat panels and cantilever beams exposed to both random- and discrete-type inputs. Increased stiffening of a panel due to curvature and pressure differential is beneficial to fatigue life.

14047 Effects of Airplane Flexibility on Wing Bending Strains in Rough Air. Thomas L. Coleman, Harry Press, and C. C. Shufflebarger. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4055, July 1957, 22 p. (TL570 Un3t)

Results as determined from flight tests of a Boeing B-29 and B-47A airplane in rough air.

14048 Flight Measurements of Boundary-Layer Temperature Profiles on a Body of Revolution (NACA RM-10) at Mach Numbers From 1.2 to 3.5. Andrew G. Swanson, James J. Buglia, and Leo T. Chauvin. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4061, July 1957, 40 p. (TL570 Un3t)

A fin-stabilized parabolic body of revolution was flight tested as a rocket-propelled model. Boundary-layer static-temperature profiles were determined from total-temperature measurements and from Mach number profiles. Data covered a Reynolds number range of 99×10^6 to 140×10^6.

14049 Performance of a Mach 4 Axially Symmetric Nozzle Designed to Operate at 40 Microns Hg in the UTIA Low Density Wind Tunnel. A. K. Sreekanth. *University of Toronto, Institute of Aerophysics, Technical Note No.* 10, Sept. 1956, 80 p. (TL570 T64.84t Contin.)

14050 Experimental Investigation of the Aerodynamics of a Wing in a Slipstream. M. Brenckmann. *University of Toronto, Institute of Aerophysics, Technical Note No.* 11, Apr. 1957, 36 p. (TL570 T64.84t Contin.)

Study to determine the distribution of the lift increase due to slipstream at different angles of attack of the wing and at different free stream-slipstream velocity ratios.

See also: **14555** (missile guidance systems); **14728** (flowmeter for in-flight refueling); **14790** (aeronautical meteorology); **14860** (supersonic turbojets); **14887** (supersonic wind tunnel strain gage recorder); **14913** (honeycomb cores).

AGRICULTURE

14051 Insect Repellents—Another New Aerosol Market. *Aerosol Age*, v. 2, July 1957, p. 34 + 1 page.

Several agents useful in agriculture and industry are described.

14052 Engineering Problems in Pelletized Feeds. H. D. Bruhn. *Agricultural Engineering*, v. 38, July 1957, p. 522-525.

A summary of some nutritional studies having effect on the engineering aspect of feed and forage harvesting and processing equipment. Particular reference is made to dairy cow requirements.

14053* Influence of 2,4-Dichlorophenoxyacetic Acid on Auxin Content of Bean Seedlings. James A. Lockhart and Robert L. Weintraub. *American Journal of Botany*, v. 44, May 1957, p. 424-428.

Treatment with 2,4-D decreases markedly the free auxin content of the terminal shoots of bean plants, as measured by the *Avena* assay.

14054 Sampling Crops for Residue Analysis. Louis Lykken, L. E. Mitchell, and S. M. Woogerd. *Journal of Agricultural and Food Chemistry*, v. 5, July 1957, p. 501-505.

The validity of any pesticide residue analysis hinges upon intelligent sample selection. Careful collection, preparation, and analysis of samples can then yield all the sound data the experiment is capable of furnishing.

14055 Metabolism and Excretion of Phosphorus-32-Labeled Diazinon in a Cow. William E. Robbins, Theodore L. Hopkins, and Gaines W. Eddy. *Journal of Agricultural and Food Chemistry*, v. 5, July 1957, p. 509-513.

Only low levels of unchanged toxicant were found in blood and milk samples. About 74% of the dose was accounted for in the urine 36 hr. after treatment.

14056 Mode of Action of Di-(*p*-Chlorophenyl)-(Trifluoromethyl)-Carbinol, as a Synergist to DDT Against DDT-Resistant Houseflies. Sasson Cohen and Alexander S. Tahori. *Journal of Agricultural and Food Chemistry*, v. 5, July 1957, p. 519-523.

As the compound counteracts its own synergistic activity, an optimum ratio of synergist to DDT exists for maximum effect.

14057 Effects of Chlorinated Hydrocarbon Insecticides on Flavors of Vegetables. J. J. Birdsall, K. G. Weckel, and R. K. Chapman. *Journal of Agricultural and Food Chemistry*, v. 5, July 1957, p. 523-526.

The results of flavor evaluations after prolonged storage of insecticide-treated raw and canned vegetables were similar to results obtained with fresh samples. Changes in flavor were more pronounced in canned samples than in raw or cooked samples.

14058 Growth and Fruiting Properties and Carbohydrate, Nitrogen and Phosphorus Levels of Cotton Plants as Influenced by Thimet. Joseph Hacskaylo. *Journal of Economic Entomology*, v. 50, June 1957, p. 280-284.

14059 Effectiveness of Two New Phosphate Insecticides for Control of Mites Injurious to Citrus in California. L. R. Jeppson, M. J. Jesser, and J. O. Complin. *Journal of Economic Entomology*, v. 50, June 1957, p. 307-310.

Applications of 2,3-*p*-dioxandiethiol *S,S*-bis(*O,O*-diethyl phosphorodithioate), or Hercules AC-528, and of *S*-(*p*-chlorophenylthio)methyl *O,O*-diethyl phosphorodithioate, or Trithion resulted in effective control of the citrus red mite and several other mites.

14060 Experiments With Sprays, Dust, and Aerosols for the Home Garden. L. P. Ditman, H. B. Owens, and Floyd P. Harrison. *Journal of Economic Entomology*, v. 50, June 1957, p. 324-328.

Residual aerosols should contain a higher percentage of toxicant than usually formulated in space aerosols.

14061 Plant Metabolism of Dithio-Systox and Thimet. Robert L. Metcalf, T. R. Fokuto, and Ralph B. March. *Journal of Economic Entomology*, v. 50, June 1957, p. 338-345.

All the simple oxidative metabolites were prepared in the pure state and their properties are recorded.

14062* Oak Wilt Spread and Damage in the Southern Appalachians. John S. Boyce, Jr. *Journal of Forestry*, v. 55, July 1957, p. 499-505.

Control measures consist of cutting wilting trees in the summer and spraying them with benzene hexachloride and pentachlorophenol in fuel oil. Stumps were poisoned with Ammate.

14063* Early Responses of Some Southern Tree Species to Gibberellic Acid. Thomas C. Nelson. *Journal of Forestry*, v. 55, July 1957, p. 518-520.

A 1% solution of gibberellic acid in lanolin was applied to young stems of 11 southern tree species. Treatment significantly increased height growth of nine species.

14064* Analysis of Factors Determining Yield in Crop Plants. I. Varietal Differences in Yield of Grain and Straw of Wheat as Influenced by Photoperiodic Treatments. II. The Influence of Photoperiodic Treatments on Characters Determining Yield in Wheat With Special Reference to the Temperature of the Ripening Period. K. K. Nanda and J. J. Chinoy. *Plant Physiology*, v. 32, May 1957, p. 157-169.

14065* Absorption and Translocation of 2,4-Dichlorophenoxyacetic Acid and P^{32} by Leaves. George E. Barrier and W. E. Loomis. *Plant Physiology*, v. 32, May 1957, p. 225-231.

14066* The Effect of Liming a Neutral Soil on the Uptake of Manganese by Plants. L. H. P. Jones. *Plant and Soil*, v. 8, May 1957, p. 301-314.

Uptake of Mn by oats in a Mn-deficient soil was increased on raising the pH from 7 to 8 with $Ca(OH)_2$.

14067* Comparative Chlorine Requirements of Different Plant Species. C. M. Johnson, P. R. Stout, T. C. Broyer, and A. B. Carlton. *Plant and Soil*, v. 8, May 1957, p. 337-353 + 4 plates.

Data on lettuce, tomato, cabbage, carrot, sugar beet, barley, alfalfa, buckwheat, corn, beans, and squash.

14068* A Comparison of the Effect of Combined Nitrogen on Nodulation in Non-Legumes and Legumes. J. T. MacConnell and G. Bond. *Plant and Soil*, v. 8, May 1957, p. 378-388 + 2 plates.

14069* (Finnish.) Finnish Fertilizer Industry in 1956. **Lannoitusaineteollisuus vuonna 1956.** T. Lapinleimu. *Teknillisen Kemian Aikakauslehti*, v. 14, May 15, 1957, p. 185-186.

Production and consumption of the K, P, N, and mixed fertilizers are discussed.

14070 California Wasps of the Genus Oxybelus. (Hymenoptera: Sphecidae, Crabroninae). Richard M. Bohart and Evert I. Schlinger. *University of California Press, California Insect Survey, Bulletin*, v. 4, no. 4, 1957, p. 103-134 + 8 plates. (SB824.C2 C12.8b Vis.)

14071 The Thrips of California. I. Suborder Terebrantia. Stanley F. Bailey. *University of California Press, California Insect Survey, Bulletin*, v. 4, no. 5, 1957, p. 143-220. (SB824.C2 C12.8b Vis.)

Characteristics, location, and other data.

See also: **14087** (leaf starch synthesis); **14095** (chemical constitution of plants); **14100** (antibiotic fungicides); **14238** (pesticide determination); **14239** (pesticide determination); **14240** (milk proteins); **14260** (determination of nicotine in tobacco); **14267** (analysis of plants); **14896** (particle-size determination of insecticide aerosols).

BIOCHEMISTRY AND BIOPHYSICS

14072* (German.) Possibilities of the Pharmaceutical Application of Polarography. **Die Anwendungsmöglichkeiten der Polarographie in der Pharmazie.** V. Volková. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 9, nos. 1-4, 1956, p. 247-263.

Various analytical processes for certain types of drugs are described and the differences between the chemical structure of compounds to be determined are treated from the point of view of polarography.

14073* (German.) Polarographic Investigations on the Exchange Ratios of Copper and Iron in the Complexes of Hydroxamic Acid and the Biological Significance of This Ratio. **Polarographische Untersuchungen über das Kupfer- und Eisenaustauschverhältnis in Hydroxamsäurekomplexen und dessen biologische Bedeutung.** V. Cieleszky, A. Dénes, and E. Sándi. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 9, nos. 1-4, 1956, p. 381-395.

Results may be applied in studying the problems of the specificity of transferrin, the iron binding group of which is supposed to be a hydroxamic acid group.

14074* (German.) Synthesis of Peptides by the Aminolysis of Nitrophenyl Esters. **Synthese von Peptiden durch Aminolyse von Nitrophenylestern.** M. Bodánszky. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 10, no. 4, 1957, p. 335-346.

14075* (German.) Microbiological Investigation of the Racemization of Proteins. **Mikrobiologische Untersuchung der Protein-Racemisation. III.** The Racemization of Gliadin. **Racemisation des Gliadins.** J. Nyilasi. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 10, no. 4, 1957, p. 353-356.

The racemization of certain aminoacids of gliadin was investigated at 25 C in 0.1 and 1.0*N* NaOH respectively.

14076 Chemical Composition of Lemon Oil. I. Isolation of a Series of Substituted Coumarins. W. L. Stanley and S. H. Vannier. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3488-3491.

Seven substituted coumarin compounds were isolated from domestic cold-pressed lemon oil by chromatographic separation on a column of powdered silicic acid.

14077 Further Research on Biphenyl, Stilbene and Diphenylethane Derivatives — Potential Anticholesterinemic, Antirheumatic Drugs. VII. G. Cavallini, E. Massarani, D. Nardi, and R. D'Ambrosio. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3514-3517.

Derivatives of biphenyl, stilbene and diphenylethane were prepared with various substituents in the 4-position: alkylacetic acids; oxyacetic acid; and propionic, butyric, acrylic, pyruvic, crotonic, β-hydroxypropionic, and γ-ethel-β-hydroxybutyric acid.

14078 Dialysis Studies. II. Some Experiments Dealing With the Problem of Selectivity. Lyman C. Craig, Te Piao King, and Alfred Stracher. *American Chemical Society, Journal*, v. 79, July 20, 1957, p. 3729-3737.

Details of a convenient cellophane dialysis cell for quantitatively studying dialysis rates. Experiments with a series of proteins of increasing mol. wt. up to 45,000 show that the rate of dialysis falls in the order of increasing mol. wt. but the membrane becomes more selective as the solute size approaches the membrane pore size.

14079 The Structure of Novobiocin. J. W. Hinman, E. Louis Caron, and Herman Hoeksema. *American Chemical Society, Journal*, v. 79, July 20, 1957, p. 3789-3800.

The antibiotic novobiocin is shown to be 7-[4-(carbamoyloxy)-tetrahydro-3-hydroxy-5-methoxy-6,6-dimethylpyran-2-yloxy] - 4-hydroxy-3-[4-hydroxy - 3 - (3-methyl-2-butenyl) - benzamido] - 8-methylcoumarin.

14080 The Synthesis and Antibiotic Activity of Analogs of Citrinin and Dihydrocitrinin. Harold H. Warren, Gregg Dougherty, and Everett S. Wallis. *American Chemical Society, Journal*, v. 79, July 20, 1957, p. 3812-3815.

14081* Solubility of Antibiotics in Twenty-Four Solvents: Use in Analysis. Peter J. Weiss, Mary Lou Andrew, and William W. Wright. *Antibiotics & Chemotherapy*, v. 7, July 1957, p. 374-377.

Solubility of 32 antibiotics and salts in 24 solvents.

14082* The Nature of the Active Site of Hemerythrin. Irving M. Klotz, Themis A. Klotz, and Harold A. Fiess. *Archives of Biochemistry and Biophysics*, v. 68, June 1957, p. 284-299.

The oxygen-carrying pigment, hemerythrin, contains 0.81% Fe and has 2.4 Fe atoms per O_2 molecule bound. Two of these atoms are bound directly to the protein through sulfhydryl side chains, and participate directly in holding the O_2 molecule.

14083* Polarography of Flavine Mononucleotide and Flavine Adenine Dinucleotide. Bacon Ke. *Archives of Biochemistry and Biophysics*, v. 68, June 1957, p. 330-340.

14084* The Interaction Between ATP and Myosin B. Kinetic Studies With the Light-Scattering Method. Shizuo Watanabe and William Sleator, Jr. *Archives of Biochemistry and Biophysics*, v. 68, June 1957, p. 373-395.

14085* Absorption of Antibiotics by Plant Cells. III. Kinetics of Streptomycin Uptake. Gerald Litwack and David Pramer. *Archives of Biochemistry and Biophysics*, v. 68, June 1957, p. 396-402.

The uptake of streptomycin by cells of the alga *Nitella clavata* fits monomolecular kinetic equations. The system shows optimal activity at pH 5 and maximal heat stability at 28 C.

14086* Inhibition of Polynucleotide Metabolism by Inhibitors of Protein Synthesis. George C. Webster. *Archives of Biochemistry and Biophysics*, v. 68, June 1957, p. 403-411.

Ribonucleoprotein particles isolated from pea seedlings incorporate the carbons of CO_2, formate, glycine, adenine, and uracil, as well as orthophosphate, into their ribonucleic acid. This requires the presence of a mitochondrial preparation, an oxidizable substrate, ribose 5-phosphate, adenosine triphosphate, and magnesium ions.

14087* The Use of C^{14} Uniformly Labeled Glucose in the Study of Starch Synthesis in the Leaf. Mohamed A. Radwan. *Archives of Biochemistry and Biophysics*, v. 68, June 1957, p. 467-477.

Two mechanisms for amylose synthesis are suggested.

14088* Stabilities of Metal Chelates of Pyridoxamine. Richard L. Gustafson and Arthur E. Martell. *Archives of Biochemistry and Biophysics*, v. 68, June 1957, p. 485-498.

The acid dissociation constants of pyridoxamine, and the formation constants of its 1:1 and 2:1 chelates with Cu(II), Ni(II), Co(II), Fe(III), Mn(II), Zn(II), and Cd(II) ions were determined by a potentiometric method. Relative stabilities are interpreted in the light of the tentative mechanism of the transamination reaction.

14089* The Properties of Lysozyme and Its Action on Microorganisms. M. R. J. Salton. *Bacteriological Reviews*, v. 21, June 1957, p. 82-99.

A useful enzyme for the isolation of bacterial structures and intracellular components, and for the specific dissolution of the cell wall in the preparation of bacterial protoplasts.

14090* Biochemistry of Spores of Aerobic Bacilli With Special Reference to Germination. Harlyn Halvorson and Brooks Church. *Bacteriological Reviews*, v. 21, June 1957, p. 112-131.

14091* (English.) **Comparative Biochemistry of the Biological Reduction of Fumaric Acid.** Harry D. Peck, Jr., Oliver H. Smith, and Howard Gest. *Biochimica et Biophysica Acta*, v. 25, July 1957, p. 142-147.

Properties of the reductase in anaerobic bacteria are compared with those of the enzyme responsible for fumarate reduction in aerobic organisms.

14092* (English.) **Inactivation of Desoxyribonuclease I by X-Rays. IV. Changes in Amino Acid Composition and Ultraviolet Light Absorption Induced by Ionizing Radiation.** Shigefumi Okada and Gunther Gehrmann. *Biochimica et Biophysica Acta*, v. 25, July 1957, p. 179-182.

Large doses of ionizing radiations sufficient to destroy the enzymic properties of this protein did not bring about an equally extensive change in the amino acid composition.

14093* **Experimenting With Organisms as Blocks.** S. C. Pearce. *Biometrika*, v. 44, June 1957, p. 141-149.

The statistical implications of using organisms as blocks are considered, special attention being given to the case of a treatment applied to one plot having a local effect on the plot to which it is applied and remote effects elsewhere in the block, and also to the case of remote and local effects interacting.

14094* (English.) **Studies on Antibiotics and Related Substances. V. Synthesis of 5-Methylenecyclopentanone-3-Carboxylic Acid, an Antitumor Isomer of Sarkomycin.** Sumio Umezawa and Mitsuhiro Kinoshita. *Chemical Society of Japan, Bulletin*, v. 30, Apr. 1957, p. 267-271.

Ultra-violet spectra are included.

14095 The Chemistry of Plants. Erston V. Miller. 174 p. 1957. Reinhold Publishing Corp., New York. (QK897 M61c)

A concise and up-to-date analysis of the chemical constituents of plants.

14096 (German.) Cupric Chloride Crystallization in Natural Science and Medicine. **Die Kupferchlorid-Kristallisation in Naturwissenschaft und Medizin.** A. Selawry and O. Selawry. 232 p. 1957. Gustav Fischer, Stuttgart, Germany. (RB45 Se48k)

Fundamentals of the cupric chloride test; use in biology and medicine. Blood crystallization, normal and in connection with various diseases.

14097* (Russian.) The Participation of Molybdenum in the Oxidation of Nitrites by Nitrifying Bacteria. **Uchastie molibdena v okislenii nitritov nitrifitsiruiushchimi bakteriiami.** G. A. Zavarzin. *Doklady Akademii Nauk SSSR*, v. 113, Apr. 21, 1957, p. 1361-1362.

14098* (Russian.) Some Derivatives of Diphenyl and Their Tuberculostatic Activity. **Nekotorye proizvodnye difenila i ikh tuberkulostaticheskaia aktivnost'.** L. F. Trefilova and I. Ia. Postovskii. *Doklady Akademii Nauk SSSR*, v. 114, May 1, 1957, p. 116-119.

Starting from 4-aminodiphenyl and its para-alkoxyderivatives, a series of new derivatives of diphenyl was obtained, especially azomethines and N,N'-substituted thiocarbamides, as well as azomethine-derivatives of 4-diphenylaldehyde.

14099* **Changes in the Ultraviolet Absorption Spectrum of Parts of Living Cells Following Irradiation With an Ultraviolet Microbeam.** R. P. Perry. *Experimental Cell Research*, v. 12, June 1957, p. 546-559.

In an irradiation area of 50 μ^2 or less heterochromatic ultraviolet radiation of the order of 2 ergs/μ^2 causes an appreciable decrease in absorbance. The relation of this decrease to a change in the chromosomal DNA is discussed.

14100 (German.) Wilt Substances and Antibiotics. **Welkstoffe und Antibiotika. XIX.** A New Synthesis of Fusaric Acid. **Eine neue Synthese der Fusarunsäure.** E. Hardegger and E. Nikles. **XX.** About the Induced Preventives on Orchids. **Über induzierte Abwehrstoffe bei Orchideen.** A. Boller, H. Corrodi, E. Gäumann, E. Hardegger, H. Kern, and N. Winterhalter-Wild. *Helvetica Chimica Acta*, v. 40, no. 4, 1957, p. 1016 + 11 pages.

14101* **The Conversion of 5-Methyldeoxycytidine to Thymidine *in Vitro* and *in Vivo*.** Seymour S. Cohen and Hazel D. Barner. *Journal of Biological Chemistry*, v. 226, June 1957, p. 631-642.

The deoxyriboside of 5-methylcytosine was isolated. The compound is deaminated *in vitro* by a partially purified pyrimidine nucleoside deaminase from *Escherichia coli*. The product, thymidine, was isolated and characterized.

14102* **The Cleavage of α-Methylserine and α-Methylolserine by Pyridoxal and Metal Ions.** J. B. Longenecker, Miyoshi Ikawa, and Esmond E. Snell. *Journal of Biological Chemistry*, v. 266, June 1957, p. 663-666.

Reactions demonstrate that an α-H atom is not required for the pyridoxal-catalyzed cleavage of α-amino β-hydroxy acids.

14103* **The Formation of Radioactive Lycopene in Ripening Tomatoes.** Irving Zabin. *Journal of Biological Chemistry*, v. 226, June 1957, p. 851-859.

Conversion of acetate to lycopene proceeds by a mechanism completely different from that which occurs in the formation of squalene and cholesterol in animal tissues. β-methyl crotonate is not an intermediate.

14104* **The Synthesis and Biological Properties of Fatty Acyl Adenylates.** Michael Whitehouse, Helga Moeksi, and Samuel Gurin. *Journal of Biological Chemistry*, v. 226, June 1957, p. 813-819.

Synthesis of mixed anhydrides of adenylic acid with acetic, hexanoic, and octanoic acids.

14105* **Reversible Synthesis of Polyribonucleotides With an Enzyme From Escherichia Coli.** Uriel Z. Littauer and Arthur Kornberg. *Journal of Biological Chemistry*, v. 226, June 1957, p. 1077-1092.

Purification of the enzyme; its properties; stoichiometry of the reversible phosphorolysis which it catalyzes.

14106* **Experimentally Induced Chromosome Aberrations in Plants. I. The Production of Chromosome Aberrations by Cyanide and Other Heavy Metal Complexing Agents.** B. A. Kihlman. **II. The Effect of Cyanide and Other Heavy Metal Complexing Agents on the Production of Chromosome Aberrations by X-Rays.** B. A. Kihlman, T. Merz, and C. P. Swanson. *Journal of Biophysical and Biochemical Cytology*, v. 3, May 1957, p. 363-390.

Increased X-ray breakage in the presence of cyanide or cupferron cannot be due to an accumulation of peroxides. The cyanide effect may be due to a complex formation between the active agents and heavy metals, presumably Fe, within the chromosomes. The consequences of this hypothesis on the concept of the "oxygen effect" are discussed.

14107* **The Form Birefringence of Lamellar Systems Containing Three or More Components.** Wayne Thornburg. *Journal of Biophysical and Biochemical Cytology*, v. 3, May 1957, p. 413-419.

Equations are derived which predict the form birefringence. These equations may be found useful in interpreting the birefringence of biological specimens and in testing certain theories about the structure of natural membranes.

14108* **Structure and Development of the Chloroplast in Chlamydomonas. I. The Normal Green Cell.** Ruth Sager and George E. Palade. *Journal of Biophysical and Biochemical Cytology*, v. 3, May 1957, p. 463-487 + 9 plates.

The cytoplasmic organization of a normal green strain of the alga *Chlamydomonas reinhardi* was investigated with the electron microscope using thin sections of OsO_4 fixed material.

14109* **Biological Availability of Tryptophan.** J. D. Gupta and C. A. Elvehjem. *Journal of Nutrition*, v. 62, July 1957, p. 313-324.

The availability of trytophan from beef, casein, egg albumin, beef fibrin, purified soybean protein, and milk powders was found to be 80 to 100% in all cases, the highest being from beef.

14110 Nitrogen Mustards Related to Chloroquine, Pamaquine, and Quinacrine. Ralph Jones, Jr., Charles C. Price, and Achintya K. Sen. *Journal of Organic Chemistry*, v. 22, July 1957, p. 783-786.

Procedures for the preparation of the N mustard analogs of these antimalarial drugs.

14111 Isolation of Vitamin Dm and Vitamin D_3 From the Irradiation Products Obtained From Sterols of the Mussel, *Modiolus Demissus*, Dillwyn. Harold G. Petering. *Journal of Organic Chemistry*, v. 22, July 1957, p. 808-811.

New compound is distinct from the known purified and crystalline vitamin D. It exists side by side in the ultraviolet irradiation products of the mussel sterols with vitamin D_3. A method for separating these two compounds as the dinitrobenzoates is described.

14112* Assimilation of Berberine and Chelidoxanthine by Bacteria. P. H. H. Gray and R. A. Lachance. *Plant and Soil*, v. 8, May 1957, p. 354-366.

Several species of bacteria are able to assimilate the alkaloid berberine while growing in extracts of *Berberis vulgaris*, *Chelidonium majus*, and *Mahonia aquifolium*.

14113* (Italian.) Problems of Radiobiology. **Problemi di radiobiologia. I.** Distribution and Toxicology of Heavy Elements: Radium and Plutonium. **Distribuzione e tossicologia di elementi pesanti: radium e plutonio.** Ferdinando Passalacqua. *Ricerca Scientifica*, v. 27, Apr. 1957, p. 1179-1192.

The symptomatology of human and experimental Ra and Pu poison, as part of the vast field of poisoning from heavy elements which forms the scope of radiobiological research.

14114 Biological Activity of Free Radicals. Barry Commoner, et al. *Science*, v. 126, July 12, 1957, p. 57-63.

Components that contain unpaired electrons are shown to occur as intermediates in biological oxidation-reductions.

14115 Survey of Biological Progress. Bentley Glass, editor. v. III. 332 p. 1957. Academic Press, New York. (QH301 Su79)

Six reviews on: embryological concepts in the twentieth century; trends in systematic botany; general problems of chromosomal evolution and speciation in animals; chemoreception and the behavior of insects; mechanisms of action of hormones on cells; respiration and cellular work and the regulation of respiration rate in plants.

14116 Effects of *in Vitro* X Irradiation (1000 r) on the Deoxyribonucleoprotein Complex of Spleen. L. J. Cole and M. E. Ellis. *U. S. Naval Radiological Defense Laboratory, Research and Development Technical Report*, USNRDL-TR-143, Mar. 1957, 18 p. (QC475 Un3.5r Contin.)

Changes were detected in the complex which are interpreted as a latent radiation-induced alteration involving disaggregation of the original DNP gel into non-gel macromolecular DNP subunits. The effect is revealed following 37 C incubation of the irradiated DNP for time intervals up to 3 hr.

14117 A Tracer Study With Oxygen-18 in Photosynthesis by Activation Analysis. Ingrid Fogelstrøn-Fineman, Osmund Holm-Hansen, Bert M. Tolbert, and Melvin Calvin. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3790, May 1957, 19 p. (UF767 U3u Contin.)

A method was devised for tracer studies with O, using paper chromatography and proton activation of O^{18} to F^{18}. Three short-term photosynthesis products containing O^{18}, were observed in a study of the path of O in green algae.

14118 A Study of Gene Action in Ultraviolet-Irradiated Bacteriophage. David R. Krieg. *University of Rochester, Atomic Energy Project (U. S. Atomic Energy Commission)*, UR-482, May 1957, 77 p. (UF767 Un3.1ru Contin.)

Analyses of individual rII$^+$ genes were achieved by crosses of ultraviolet-sterilized wild-type phage and unirradiated phage which were mutant for the gene being investigated.

See also: **14219** (analysis of amino acids); **14227** (uric acid in biologic fluids); **14228** (determination of esterase); **14256** (identification of anesthetics); **14265** (analysis of essential oils); **14566** (computer for vector electrocardiography); **14767** (yeasts in liquid sugar); **14865** (biochemical library code).

CERAMICS AND CONCRETE

14119* (German.) Shrinkage, Creep, and Compaction of High-Strength Concretes: Concrete of Minimum Shrinkage and Creep. **Das Kriechen und die Verdichtung hochwertiger Betone: kriechfeste Betone.** G. Balázs and J. Kilián. *Acta Technica Academiae Scientiarum Hungaricae*, v. 17, nos. 1-2, 1957, p. 113-142.

Shrinkage and creep of structural elements of concrete can be greatly reduced by applying a technique for strengthening the concrete consisting of steaming and drying. This combined method is more economical than steaming alone and is not so dangerous to the final strength of the concrete as drying.

14120 Determination of the Fineness and Consistency of Ceramic Glazes. R. F. Morrison, H. C. Draker, and H. D. Carter. *American Ceramic Society, Bulletin*, v. 36, July 1957, p. 256-259.

Use of a Fisher "Sub-Sieve Sizer" to determine particle size and a Brookfield viscometer for measuring consistency. Correlation of data for milling time, pickup, consistency, and effect of electrolyte.

14121 Use of Auxiliary Fluxes to Improve Structural Clay Bodies. J. O. Everhart. *American Ceramic Society, Bulletin*, v. 36, July 1957, p. 268-271.

14122 Thermal Stresses Around a Heated Hole in a Large Glass Plate. A. C. Thompson. *American Ceramic Society, Journal*, v. 40, July 1957, p. 244-245.

Stress near the hole is independent of temperature distribution around the hole and dependent only on the physical constants of the glass and the temperature of the lateral surface of the hole.

14123 Activities in Borosilicate Melts. I. Some Melts in the System CaO-B_2O_3. W. J. Knapp and H. Flood. *American Ceramic Society, Journal*, v. 40, July 1957, p. 246-249.

Several types of structural models were evaluated for some calcium borate melts by calculating melt activities.

14124 Magnetic and Magnetostrictive Properties of Magnesium-Nickel Ferrites. Paul O. Hoffmann. *American Ceramic Society, Journal*, v. 40, July 1957, p. 250-252.

Nickel ferrite is superior to mixed Ni-Mg ferrites as far as these properties are concerned.

14125 Use of Fly Ash in Concrete. Albert G. Timms and William E. Grieb. Paper from "American Society for Testing Materials, Proceedings". v. LVI. 1956. p. 1139-1214. (TA401 Am35p Vis.)

Concrete containing fly ash showed less shrinkage upon drying than concrete without fly ash. All substitutions of fly ash for portland cement adversely affected the resistance of both air-entrained and non air-entrained concrete to attack by $CaCl_2$ solutions used for ice removal.

14126 (German.) Comparative Method for Determining the Thermal Conductivity of Ceramic Materials. **Vergleichsverfahren zur Ermittlung der Wärmeleitfähigkeit keramischer Werkstoffe.** F. Klasse, A. Heinz, and J. Hein. *Berichte der Deutschen Keramischen Gesellschaft*, v. 34, June 1957, p. 183-189.

Theory; methods and equipment.

14127* Loss in Strength of Silica Bricks Reheated in Hydrogen or Carbon Monoxide. K. Grant and W. O. Williamson. *British Ceramic Society, Transactions*, v. 56, June 1957, p. 277-295.

Weakening after reheating at 1200 C was demonstrable by impact, crushing, cross-bending, and abrasion tests. Study of the megascopic and microscopic characteristics of the affected test-pieces did not suffice to explain the loss in strength, although an increase in the proportion of crystallized Ca silicate may have been a contributory factor.

14128* Thermal Conductivity of Some Refractory Materials. J. F. Clements and J. Vyse. *British Ceramic Society, Transactions*, v. 56, June 1957, p. 296-308.

Data on silica bricks, carbon blocks, and sillimanite, fused-alumina, silicon carbide, and magnesite refractories; influence of their physical properties and other factors on conductivity.

14129* The Mechanical Properties of Basic Refractories at High Temperatures. W. F. Ford and J. White. *British Ceramic Society, Transactions*, v. 56, June 1957, p. 309-330.

14130 Granulated Blast-Furnace Slags and Slag Cements. R. L. Pevzner. *Henry Brutcher Translation No.* 3938, 6 p. (From *Zhurnal Prikladnoi Khimii*, v. 27, no. 2, 1954, p. 226-227.) Henry Brutcher, Altadena, Calif.

Review of book of above title, published in 1953 by Promstroiizdat, Moscow; 224 pages. Authors are P. P. Budnikov and I. L. Znacho-Yavorskii. Book presents basic information on the classification and physico-chemical properties of various blast-furnace slags, as well as on methods of their processing and evaluation for the production of slag cements.

14131 Pyroceram. Claim Unique Properties for Family of Basic Materials. *Ceramic Industry*, v. 69, July 1957, p. 72-73.

Product is harder than high C steel, lighter than Al, and stronger than plate glass.

14132 Here Are Materials and Techniques for Coating Ceramics. C. Alan Lindquist, Jr. *Ceramic Industry*, v. 69, July 1957, p. 85-89.

Materials, techniques, and methods of applying conductive coatings. (To be continued.)

14133* Methods Used to Determine Grain Size in the Pottery Industry. II. S. W. Ratcliffe. *Ceramics*, v. 9, June 1957, p. 24-27.

The centrifuge, permeability, turbidimetric, and gas adsorption methods of grain size determination.

14134* (French.) Replacing Barium by a Rare Earth in the Hexaferrite $BaO \cdot 6Fe_2O_3$. **Sur la substitution de baryum par une terre rare dans l'hexaferrite $BaO, 6Fe_2O_3$.** André Deschamps and Félix Bertaut. *Comptes Rendus*, v. 244, June 17, 1957, p. 3069-3072.

Rare earths, A=La, Pr, Nd, Sm, and Eu can be substituted for Ba in $BaFe_{12}O_{19}$ with formation of $Ba_{1-x}A_xFe_{12}O_{19}$. The respective limits of solutions are X=0.7, 0.4, 0.3, 0.1, and 0.1 at 400 C.

14135* (Russian.) Production of Rubidium and Cesium Glasses and Investigation of Some of Their Properties. **Poluchenie i issledovanie nekotorykh svoistv rubidievykh i tsezievykh stekol.** V. V. Moiseev, E. A. Materova, and A. A. Beliustin. *Doklady Akademii Nauk SSSR*, v. 113, Apr. 1, 1957, p. 824-827.

14136 Symposium on High Temperature Refractories. *Iron and Steel Engineer*, v. 34, July 1957, p. 106-118.

Three papers dealing with refractories for open-hearth and reheat furnaces and soaking pits.

14137* (Russian.) Growth and Investigation of Monocrystals of Ferroelectrics. **Vyrashchivanie i issledovanie monokristallov segnetoelektrikov.** N. S. Novosil'tsev, A. L. Khodakov, M. L. Sholokhovich, E. G. Fesenko, and O. P. Kramarov. *Izvestiia Akademii Nauk SSSR, Seriia Fizicheskaia*, v. 21, Mar. 1957, p. 295-304 + 2 plates.

Growth and properties of crystals of Ba, Sr, and Pb titanates, lead zirconate, $(Ba,Cr)TiO_3$ and $(Ba,Pb)TiO_3$.

14138* (Russian.) Piezo Properties of Ferroceramics Made From Barium Titanate With Certain Additives. **P'ezosvoistva segnetokeramiki iz titanata bariia s nekotorymi dobavkami.** S. V. Bogdanov. *Izvestiia Akademii Nauk SSSR, Seriia Fizicheskaia*, v. 21, Mar. 1957, p. 390-393.

Study of $BaTiO_3$ with SnO_2 additives.

14139* Thermodynamic Behavior of Quartz and Other Forms of Silica in Pure Water at Elevated Temperatures and Pressures With Conclusions on Their Mechanism of Solution. Rudolf Mosebach. *Journal of Geology*, v. 65, July 1957, p. 347-363.

14140* Thermal Length Changes of Some Refractory Castables. S. J. Schneider and L. E. Mong. *Journal of Research, National Bureau of Standards*, v. 59, July 1957, p. 1-8.

Tests consisted of determinations on castable specimens that had been heat treated at either 110, 1,050, or 1,300 C. Curves of the 110 C group indicated contractions associated with cement reactions, namely, the loss of water of hydration and the conversion of amorphous alumina to γ alumina.

14141* Thermal Conductivity of Beryllium Oxide From 40° to 750° C. David A. Ditmars and Defoe C. Ginnings. *Journal of Research, National Bureau of Standards*, v. 59, Aug. 1957, p. 93-99.

14142* Noncrystal Ionic Model for Silica Glass. Leroy W. Tilton. *Journal of Research, National Bureau of Standards*, v. 59, Aug. 1957, p. 139-154.

Proposed model is constructed of pentagonal rings of symmetrical tetrahedra so connected that all five silicons lie in one plane and all angles Si—O—Si approximate 180°. It gives the correct density within 10%.

14143 Beryllium and Beryllia. L. David. *Metal Industry*, v. 90, June 28, 1957, p. 546.

Production, characteristics, and application of BeO. (To be continued.)

14144 Emery. Gerald M. Friedman. *Mining Engineering*, v. 9, July 1957, p. 745-746.

Occurrence, composition, preparation, and use of emery.

14145 Synthesis of Some Ferrites. Horst Kedesdy and Arthur Tauber. *Mining Engineering*, v. 9; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 208, July 1957, p. 784-792.

Solid solution formation has widened the field of ferrite synthesis and has led to methods of preparing materials with a large variety of magnetic properties.

14146* (German.) The Partial Binary Systems: UC-TiC, -ZrC, -VC, -NbC, -TaC, $-Cr_3C_2$, $-Mo_2C$, and -WC. **Zur Kenntnis der Teilsysteme: UC-TiC, -ZrC, -VC, -NbC, -TaC, $-Cr_3C_2$, $-Mo_2C$ und -WC.** H. Nowotny, R. Kieffer, F. Benesovsky, and E. Laube. *Monatshefte für Chemie*, v. 88, June 1957, p. 336-343.

Attempts at stabilization of UC by high-melting carbides of the 4a, 5a, and 6a groups. Specimens were fabricated by hot pressing and their structure determined by X-ray diffraction.

14147* (Russian.) Technical Properties of Dolomite Sludges. **O tekhnicheskikh svoistvakh dolomitovykh shlamov.** G. Z. Dolgina. *Ogneupory*, v. 22, no. 6, 1957, p. 260-268.

Production and properties of metallurgical dolomite used in open-hearth furnaces and basic converter linings.

14148* (German.) The Submicroscopic Structure of Active Magnesium Oxide. **Über die submikroskopische Struktur von aktivem Magnesiumoxyd.** L. Bachmann. *Radex Rundschau*, no. 3, May 1957, p. 564-577.

Preparation of active MgO from natural and synthetic $MgCO_3$ at different temperatures and CO_2 pressures; microscopic investigations of the initial material and the decomposition products; connection between porosity and activity; recrystallization of MgO of different degrees of purity.

14149 Dislocations in Silicon Carbide Crystals: Interferometric and X-Ray Study of Polytypism. Ajit Ram Verma. *Royal Society, Proceedings*, v. 240, ser. A, July 16, 1957, p. 462-472 + 2 plates.

Phase-contrast microscopic and multiple-beam interferometric techniques were used to study the growth spiral structure on (0001) and for the measurement of spiral step heights. X-ray methods gave the lattice constants. Rhombohedral crystals growing from two dislocations, one positive and the other negative, are shown to lead to the creation of a positive and negative rhombohedron.

14150* (French.) Effect of Chromium Oxide on the Staining of Sulfide-Amber Glass. **Influence de l'oxyde de chrome sur la coloration des verres ambrés aux sulfures.** S. de Lajarte and F. Mahieux. *Silicates Industriels*, v. 22, May 1957, p. 259-270.

Increasing addition of Cr_2O_3 to vitrifiable mixtures changed the coloration of amber glass from brown to green above 0.1% CrO_2.

14151* (French.) Control of Cement Plant Sintering. **La régulation de la cuisson au four de cimenterie.** J. Parisis. *Silicates Industriels*, v. 22, May 1957, p. 271-279.

Owing to the real temperature, the flame potential, the rate of flow of gases at the entrance of the kiln, three points at most can be controlled economically. Practical application is shown by a simultaneous study of enthalpy diagram and conditions of exchange.

14152* (German.) A Critical View of the Determination of the Tensile Strength of Ceramic Insulating Materials According to VDE 0335-7.56, Section 7. **Kritische Betrachtung zur Ermittlung der Zugfestigkeit nach VDE 0335/7.56 § 7 für keramische Isolierstoffe.** Gerfried Pachmann. *Silikattechnik*, v. 8, May 1957, p. 190-194.

Structure of the potential field during the tensile test as a function of test piece shape differences is represented in plexiglass patterns by means of photostress measurements.

14153 Some Problems Relating to the Constitution of Liquid Slags With Special Reference to the Na_2O-MnO-SiO_2 System. R. Hay, P. T. Carter, and S. K. Kabi. *Society of Glass Technology, Journal*, v. 40, Oct. 1956, p. 429T-444T.

Physical methods of investigating slag systems with particular reference to microscopic examination by means of reflected light and thermal methods. Thermal equilibrium diagrams. A region of liquid immiscibility occurring in the Na_2O-MnO-SiO_2 system appears different in nature from those commonly encountered in silicate systems.

14154 Radiation Coloration in Sodium Aluminium Silicate Glasses. M. Levy. *Society of Glass Technology, Journal*, v. 40, Oct. 1956, p. 462T-469T.

Gamma radiation produces three absorption bands in sodium aluminum silicate glass, with maxima situated at 2.0, 2.5, and 3.6 e.v.

14155* (Czech.) Sintered Metal Oxides—New Tool Material. **Slinuté kysličníky kovů—nový nástrojový materiál.** Witold Biernawski. *Strojírenská Výroba*, v. 5, June 1957, p. 42-245.

Manufacturing technique and tests of sintered metal oxide. Use of ultraviolet rays in testing. Material can be used for cutting light and non-ferrous metals, alloys, and steel, provided cutting is uninterrupted. Material can replace 10 to 15% of costly sintered carbides.

14156* (Spanish.) Behavior of Grinding Wheels. **Comportamiento de las muelas de rectificar.** *Tecnica Metalurgica*, v. 13, Mar.-Apr. 1957, p. 81-86.

Hardness of grinding wheels was studied as a function of the quality and grain size of the abrasive. Effect of wheel characteristics on work performed. Criteria for selection of wheels for a particular job.

14157 Synthetic Mica Investigations. IX. Review of Progress From 1947 to 1955. R. A. Hatch, R. A. Humphrey, W. Eitel, and J. E. Comeforo. *U. S. Bureau of Mines, Report of Investigations* 5337, June 1957, 79 p. (TN21 Un3r)

Fundamental studies of fluor-phlogopite and other fluorine-micas and production of synthetic mica sheets on a pilot-plant scale.

14158 X-Ray Diffraction Data for Silicates, Aluminates, and Alumino-Silicates of Strontium. Paul S. Dear. *Virginia Polytechnic Institute, Engineering Experiment Station Series No.* 117, Apr. 1957, 16 p. (TN21 V81b Vis.)

14159 Resumé of Uranium Oxide Data. V. J. Belle. *Westinghouse Electric Corporation, Atomic Power Division (U. S. Atomic Energy Commission)*, WAPD-PWR-PMM-429 (Del.) Mar. 1956, 72 p. (UF767 Un3.1wa)

A review of the properties and preparation of UO_2.

14160 Ceramic Reinforced Alloys and Plated Cermets. M. T. Curran, R. P. Riegert, R. K. Francis, R. S. Truesdale, and J. R. Tinklepaugh. *Wright Air Development Center, Materials Laboratory, WADC Technical Report* 57-39, May 1957, 42 p. (TL507 Un3.18w Vis.)

A precision casting technique was developed for the reinforcement of super alloys with ceramic rods. Procedures were found for the electroplating of cermets with Ni and Cr to improve their impact resistance and for the chemical plating of Ni on TiC grains.

See also: **14215** (determination of cations in clay and mica); **14298** (preparation of ThO_2); **14472** (grain size of decomposed Al hydrate); **14520** (decorating Al enamels); **14598** (electrical conductivity of fused quartz); **14894** (hot-pressing furnace); **15002** (ramming mix for blast furnace runners); **15342** (ball mill charge makeup); **15363** (preparation of Ni ferrite).

CHEMICAL ENGINEERING

14161* (English.) **Heat-Loss and Pressure-Drop in Pipelines Transporting Heated Oil.** E. Guman. *Acta Technica Academiae Scientiarum Hungaricae*, v. 17, nos. 3-4, 1957, p. 253-287.

14162 Effect of Gas Thermal Conductivity on Local Heat Transfer in a Fluidized Bed. A. Jacob and G. L. Osberg. *Canadian Journal of Chemical Engineering*, v. 35, June 1957, p. 5-9.

Heat transfer coefficients were measured in fluidized beds of glass beads with a horizontal hot wire probe. Eight gases with thermal conductivities ranging from 0.0048 to 0.097 btu./ft./hr./deg. F at 32 F were investigated. A heat transfer mechanism based on transient heat flow is proposed.

14163 The Effect of Sonic Energy on Mass Transfer in Solid-Gas Contacting Operations. J. W. Hodgins, T. W. Hoffman, and D. C. Pei. *Canadian Journal of Chemical Engineering*, v. 35, June 1957, p. 18-24.

Addition of sonic vibrational energy at L.F. and at intensity greater than 120 decibels significantly increases the rate at which material is transferred across solid-gas interfaces in a bed of solids. The enhancement is greatest for low flows of gas through fixed beds, and the improvement is negligible when full fluidization has developed.

14164 Studies on Flocculants for Settling, Thickening, and Filtration in the Sherritt Gordon Process. D. J. I. Evans, W. Kunda, and P. Chiang. *Canadian Journal of Chemical Engineering*, v. 35, June 1957, p. 25-32.

Effect of excessively slimy leach residues on the liquid-solids separation of the leach liquor from the residues. Effect of Separan 2610 on refinery operation.

14165 Flooding Phenomena in Packed Gas Absorption Columns. G. W. Minard and M. D. Winning. *Canadian Journal of Chemical Engineering*, v. 35, June 1957, p. 39-46.

Pressure drops may be predicted by an empirical relationship which appears to depend on gas flow rate, liquid flow rate, and fluid properties.

14166 Evaluate Kinetic Data Rapidly. Gerald A. Lessells. *Chemical Engineering*, v. 64, Aug. 1957, p. 251-256.

Nomographs and factors speed kinetic calculations. Methods show how to determine the effect of backmixing and aid in reactor design.

14167 Variables in Fixed Bed Systems. Max Leva. *Chemical Engineering*, v. 64, Aug. 1957, p. 263-266.

Influence of particle characteristics on the voidage, pressure drop, and flow resistance in packed systems.

14168 Mechanical Energy Improves Diffusional Separations. Herbert F. Wiegandt. *Chemical Engineering*, v. 64, Aug. 1957, p. 273-279.

Applying mechanical energy to aid mass transfer can improve many diffusional separations. Among the most likely ones are ion exchange, adsorption, molecular distillation, gas absorption, and extraction.

14169* The Effect of Absorption on the Wetted Area of Absorption Towers. J. Bond and M. B. Donald. *Chemical Engineering Science*, v. 6, no. 6, 1957, p. 237-244.

Experiments were carried out using a 1-in. diameter wetted wall column for absorbing ammonia from a gas stream and the water rate which will just maintain a continuous film on the column was found. Film breakdown can be prevented by using a surface active agent.

14170* A Graphical Method for the Calculation of Cooler-Condensers. G. H. P. Bras. *Chemical Engineering Science*, v. 6, no. 6, 1957, p. 277-282.

Design method is based on the application of a diagram of the logarithm of the noncondensing gas partial pressure vs. the temperature.

14171* (German.) The Enrichment of the Light Uranium Isotope, by the Diffusion Process. **Die Anreicherung des leichten Uranisotops nach dem Diffusions-Verfahren.** E. W. Becker. *Chemie-Ingenieur-Technik*, v. 29, June 1957, p. 365-371.

The fundamentals of the diffusion process for enrichment of U^{235} and the method for evaluating the most favorable operating conditions are presented with the aid of the optimum theory for the separation process.

14172 Solid-Solid Contacting — The Aspeco Oil Shale Process. David W. Mitchell. *Engineering and Mining Journal*, v. 158, July 1957, p. 100-101.

Heat exchange between heated, metallic or ceramic balls and crushed mineral crude is accomplished in a rotary kiln or drum; the balls and mineral travel countercurrently to each other.

14173* Low Temperature Chlorine Liquefaction. K. Nürmberger and H. Kubli. *Escher Wyss News*, v. 29, Sept.-Dec. 1956, p. 20-23.

Development of Cl liquefaction plants which operate without piston compressors and with direct cooling of the chlorine condensers by evaporating a refrigerant. Design features prevent the mixing of entering Cl gases with the gases from which as much Cl has already been liquefied as is possible.

14174 Fire Protection for Chemicals. Charles W. Bahme. 147 p. 1956. National Fire Protection Association International, Boston. (TH9446.C5 B14f)

An outline of some methods for the prevention, detection, control, and extinguishment of fires which are likely to arise wherever chemicals and explosives are used, processed, produced, stored, or transported.

14175 (German.) Fundamentals of Chemical Engineering. **Grundlagen der Chemischen Technik. v. II.** Physical Chemistry as an Introduction to Chemical Engineering. **Physikalische Chemie als Einführung in die chemische Technik.** Otto Fuchs. 496 p. 1957. H. R. Sauerlander & Co., Aarau, Switzerland. (QD453 F95p)

For physicists, chemists, engineers, designers of measurement and control instruments and apparatus for chemical and related industries, production and economics engineers, and sellers of industrial products. Deals with the elements, practical stoichiometry, thermodynamic functions, gases, condensed phases, equilibrium between phases, mixture phases, phase surfaces, thermochemical data, chemical equilibrium, reactions with solid phases, electrochemistry, radiation chemistry, and chemical kinetics.

14176 (German.) The Thermodynamic Efficiency of Distillation. **Der thermodynamische Nutzeffekt der Destillation.** Werner Kuhn, A. Narten, and E. Peterli. *Helvetica Chimica Acta*, v. 40, no. 4, 1957, p. 1066-1084.

The thermodynamic efficiency of a separation of materials is the quotient from the mechanical energy that is needed to conduct the separation of materials isothermally and reversibly, and the mechanical energy that is practically used for the separation.

14177 (German.) Differences in Steam Pressure of Isotopic Compounds (Infrared Share of the Dispersion Interaction as the Reason for Higher Volatility of the Heavy Molecules). **Dampfdruckunterschiede isotoper Verbindungen. (Infrarot -Anteil der Dispersionswechselwirkung als Ursache für grössere Flüchtigkeit der schweren Molekelspezies).** P. Baertschi and W. Kuhn. *Helvetica Chimica Acta*, v. 40, no. 4, 1957, p. 1084-1103.

Investigations of the contribution of intramolecular vibrations found in infrared to the Van der Waal's forces of attraction originating from the dispersion interaction, shows that this infrared interaction always favors a higher volatility of molecular species which contain heavy isotopes.

14178 Multiple Effect Evaporator Calculations. N. J. Hassett. *Industrial Chemist*, v. 33, July 1957, p. 331-337.

A procedure for the complete analysis of a complex evaporator system to a high degree of accuracy.

14179* The Importance of Particle Size Distribution for Technical Centrifugal Separation. N. E. Bergner. *Institution of Chemical Engineers, Transactions*, v. 35, no. 3, 1957, p. 181-194.

A method of characterizing the separability of suspensions is derived. Formulas representing the mode of operation of centrifugal separators are based on this method.

14180* Heat-Transfer in Packed Beds. P. H. Calderbank and L. A. Pogorski. *Institution of Chemical Engineers, Transactions*, v. 35, no. 3, 1957, p. 195-207.

Complete data on heat-transfer in beds packed with celite and alundum particles simulating the conditions found with most industrial catalytic systems.

14181* A Method of Design of Continuous Through-Circulation Dryers. H. C. Glover and A. A. H. Moss. *Institution of Chemical Engineers, Transactions*, v. 35, no. 3, 1957, p. 208-218.

Design method for full-scale dryers is based on a simple laboratory experiment.

14182 How to Use the Absorption Factor to Keep Lean-Oil Rate Down. W. T. Lanz. *Oil and Gas Journal*, v. 55, July 15, 1957, p. 88-91.

Method provides maximum product recovery at economic operating conditions. Absorption of undesirables is held to a minimum.

14183 Urea Adduction—A Process for Making Light, Low-Pour Lubes From Waxy Crudes. T. H. Rogers, J. S. Brown, Robert Diekman, and G. D. Kerns. *Oil and Gas Journal*, v. 55, July 15, 1957, p. 107 + 2 pages.

Two-step operation involving solvent dewaxing followed by urea dewaxing combines the best features of both, may be useful for one-step dewaxing of stocks that contain little wax.

14184* (Czech.) Empirical Equation of Function of Ammonia Scrubbers and Gas Washers. **Empirické funkčné rovnice čpavkových skrubrov a pračiek plynu.** K. Böhm. *Paliva*, v. 37, June 1957, p. 187-193.

Derivation of relationship between factors determining efficiency of operation of ammonia scrubbers, based on dimensional analysis. Method of calculation for a concrete case. Analysis of scope and conditions for validity of equation obtained.

14185 Ammonia Absorption Refrigeration Selected for Gasoline Plant. Whit Downer. *Petroleum Engineer (Management Ed.)*, v. 29, July 1957, p. C25 + 3 pages.

An old refrigeration principle applied to modern gas processing as a means of reducing maintenance costs and increasing operating flexibility.

14186 The Complete Technical Story of the World's Most Modern Refinery—Tidewater. *Petroleum Processing*, v. 12, July 1957, p. 99-170.

Details of the processes, services, plant, and people are presented in 32 articles.

14187 Examine These Ways to Use Selective Adsorption. *Petroleum Refiner*, v. 36, July 1957, p. 136-140.

A brief description of how selective adsorption with a zeolite adsorbent works. Commercial and pilot-plant data are given as examples.

14188 Here's Data on Propane Fractionation. Edwin E. Smith and Carl E. Fleming. *Petroleum Refiner*, v. 36, July 1957, p. 141-144.

Some advantages of separating hydrocarbons according to their solubility in liquid propane. Data are compared with separation by distillation.

14189 Nine Variables in Catalyst Flow. Frederick A. Zenz. *Petroleum Refiner*, v. 36, July 1957, p. 175-183.

The saltation velocity or the pipe diameter for a horizontal line carrying a solid catalyst can be calculated from the given charts and data.

14190* Evaporation Control. The Application of Monolayers for the Reduction of Evaporation Losses From Water Surfaces. *Water and Water Engineering*, v. 61, June 1957, p. 255-259.

Application of cetyl alcohol in both solid and liquid forms.

14191 The Production of Boron Trichloride by Means of the High Intensity Electric Arc Process. Chas. Sheer, A. W. Diniak, J. A. Dyer, and S. Korman. *Wright Air Development Center, Materials Laboratory, WADC Technical Report* 56-487, Mar. 1957, 59 p. (TL507 Un3.18w Vis.)

The chlorination of borax in the high intensity arc may be used to produce boron trichloride according to the over-all reaction: $Na_2B_4O_7 + 7C + 7Cl_2 \rightarrow 4\ BCl_3 + 2NaCl + 7CO$. Design factors important for expansion to large-scale development were investigated.

See also: **14639** (filtering of electroplating solutions); **14721** (prices of chemicals); **14758** (aerosol containers for foods); **14780** (high intensity combustion in chemical engineering); **14855** (cooling water treatment); **14955** (Ti tubing); **15427** (industrial odor control); **15441** (water works practice).

CHEMISTRY—ANALYTICAL

14192* (German.) New Trends in Polarography. **Neuere Richtungen in der Polarographie.** J. Heyrovský. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 9, nos. 1-4, 1956, p. 3-16.

Recently developed polarizing electrodes and techniques.

14193* (German.) The Polarography of Magnesium. **Die Polarographie des Magnesiums.** K. Győrbíro, L. Poós, and J. Proszt. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 9, nos. 1-4, 1956, p. 27-36.

Readily evaluable Mg^{2+}-ion waves may be obtained with the use of a modified streaming Hg electrode in a saturated solution of tetramethyl ammonium chloride in the concentration range 3.10^{-3} to 5.10^{-4} *M*.

14194* (German.) Polarometric Determination of Iron(III)-Ions by Ascorbic Acid. **Die polarometrische Bestimmung der Eisen(III)-Ionen mit Ascorbinsäure.** L. Erdey and A. Karsay. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 9, nos. 1-4, 1956, p. 43-48.

The method evolved may be used for the determination of iron(III)-ions of as low a concentration as 0.001 *M*. The usual accompanying ions, excepting Cu and Ag, do not interfere with the determination, whereas the presence of strong oxidizing substances should be eliminated.

14195* (German.) Polarographic Determination of the Methylene Blue Number of Regenerated Celluloses of High Carboxyl Content, by the Suppression of Oxygen Maxima. **Polarographische Bestimmung der Methylenblauzahl an hoch carboxylierten regenerierten Zellulosen mittels der Unterdrückung des Sauerstoffmaximums.** I. Rusznák, I. Králik, and K. Fukker. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 9, nos. 1-4, 1956, p. 59-71.

Investigations were aimed at an unambiguous determination of the methylene blue number in cellulose samples of high carboxyl content, establishing the stoichiometric correlation of methylene blue number and carboxyl content, and evolving a polarographic method for determining the methylene blue number.

14196* (German.) Polarographic Behavior and Possibilities of Determination of Certain Inorganic Nitrogen Compounds. **Polarographisches Verhalten und Bestimmungsmöglichkeiten einiger anorganischer Stickstoffverbindungen.** J. Mašek. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 9, nos. 1-4, 1956, p. 105-117.

The polarographic behavior of nitrates, nitrites, nitrous acids, nitrogen oxides, metallic complexes containing NO or NO_2 groups, hydroxylamine, and hydrazine; possibilities of their determination.

14197* (German.) Polarography in Practical Metallurgy. **Polarographie in der metallurgischen praxis.** M. Spálenka. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 9, nos. 1-4, 1956, p. 171-178.

Four analyses show application of the technique for determining Cr in permalloy, Zn in Al-Zn-Mg alloy, Pb in Sn, and Cu, Cd, and Ni in stannite.

14198* (German.) The Use of Amperometric Titrations in the Analysis of Metals. **Die Anwendung amperometrischer Titrationen in der Metallanalyse.** I. Bozsai. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 9, nos. 1-4, 1956, p. 195-222.

The determination of V, Cr, Cr_2O_3, V_2O_5, Mn, Co, Sb, As, Bi, Te, Ag, and Zn.

14199* (German.) Determination of Oxygen. **Sauerstoffbestimmungen.** M. Březina. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 9, nos. 1-4, 1956, p. 407-420.

The determination of O by polarography offers the advantages of being extremely simple and quick, and making possible the continuous recording of changes in the O content, mainly in undisturbed biological systems, water, and gases.

14200* (German.) The Polarographic Investigation of Sodium Dithionite. **Die polarographische Untersuchung des Natriumdithionits.** F. Péter. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 9, nos. 1-4, 1956, p. 421-433.

14201* (German.) Determination of Hydrogen Peroxide in the Presence of Oxalic Acid. **Bestimmung des Wasserstoffperoxyds neben Oxalsäure.** J. Bitskei. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 10, no. 4, 1957, p. 327-333.

The H_2O_2 was determined in alkaline medium in a sample containing both H_2O_2 and oxalic acid, then the liquid was acidified and oxalic acid determined.

14202* (English.) **Separation of Uranium(VI) by Paper Chromatography.** Gy Almássy and M. Vigvári. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 11, nos. 1-2, 1957, p. 1-6.

By changing the acid concentration of the solvent, an optimum composition was established for the separation of U by paper chromatography. Alien metal ions did not interfere with the test. Limit of detection: 1γ U. The chromatogram also proved suitable for semiquantitative analysis. Lower limit of determination: 5γ U/0.1 ml.

14203* (English.) **Microdetection and Colorimetric Microdetermination of Oxalate Ions by an Activated Reaction.** Gy. Almássy and I. Dexső *Acta Chimica Academiae Scientiarum Hungaricae*, v. 11, nos. 1-2, 1957, p. 7-13.

The microdetection of oxalate is based on the reaction between V and aniline which may be activated by oxalate ions. The quantitative microdetermination is based on the reaction of Cr(VI) and Mn(II).

14204* (German.) A Titrimetric Method for the Quantitative Determination of Dyestuffs. **Titriermethode zur quantitativen Bestimmung der Farbstoffe.** E. Bene and K. Géczy. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 11, nos. 1-2, 1957, p. 49-56.

Cetyl pyridinium bromide and chloroform are used.

14205* (German.) Permanganometric Determination of Vanadium in Ferrovanadium, Subsequent to a Reduction by Sodium Nitrite. **Permanganometrische Vanadinbestimmung in Ferrovanadin nach Reduktion mit Natriumnitrit.** L. Erdey and K. Vigh. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 11, nos. 1-2, 1957, p. 73-83.

The determination may be carried out quickly and exactly by dissolving the sample with a mixture of H_2SO_4 and HNO_3 and reducing the metal by $NaNO_2$.

14206* (German.) Determination of Capsaicin Content. **Bestimmung des Capsaicingehaltes.** P. Spanyár, E. Kevei, and M. Kiszel. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 11, nos. 1-2, 1957, p. 137-149.

A new method, based on the observation that, under strictly prescribed conditions in alkaline-ethanolic medium, diazosulfanilic acid and capsaicin undergo a specific color reaction. The intensity is proportional to the amount of capsaicin participating in the reaction.

14207* (German.) Indirect Polarographic Determination of Calcium. **Über eine indirekte polarographische Calciumbestimmung.** I. Erdey and A. Karsai. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 11, nos. 1-2, 1957, p. 171-178.

14208* (German.) Volumetric Determination of Iron (III)-Ions With the Use of Tripolyphosphoric Acid. **Massanalytische Bestimmung von Eisen (III)-Ionen mittels Tripolyphosphorsäure.** L. Jankovits. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 11, nos. 1-2, 1957, p. 185-194.

The reagent recommended is appreciably cheaper than the ethylenediamine tetraacetic acid applied so far in complexonometric titrations.

14209 Radio-Analysis of Krypton and Xenon and Its Use in Diffusion Experiments With Silver. J. M. Tobin. *Acta Metallurgica*, v. 5, July 1957, p. 398-403.

A method was evaluated which is capable of analyzing relative concentrations of Kr and Xe gases whose total concentration is in the range of 10^{-10} to 10^{-8} gram atoms. The values of diffusion coefficients at 500, 600, 700, 735, and 800 C are given.

14210 Paper Chromatographic Separation of Aliphatic Lactones. P. G. Keeney. *American Oil Chemists' Society, Journal*, v. 34, July 1957, p. 356-358.

A homologous series of n-aliphatic γ lactones from butyrolactone through dodecalactone can be resolved as hydroxamic acid derivatives.

14211* (German.) Separation of Inorganic Materials by Selective Distribution. **Über die Trennung Anorganischer Stoffgemische durch Verteilung. XIV.** Division of Polyiodides Between Aqueous Solutions and Organic Solvents. **Die Verteilung von Polyjodiden zwischen wässrigen Lösungen und organischen Lösungmitteln.** Rudolf Bock and Tatjana Hoppe. *Analytica Chimica Acta*, v. 16, May 1957, p. 406-415.

14212* (English.) **The Use of Cacotheline as an Oxidation-Reduction Indicator Before the Volumetric Oxidation of Iron.** David N. Hume and I. M. Kolthoff. *Analytica Chimica Acta*, v. 16, May 1957, p. 415-418.

Used as an oxidation-reduction indicator in the removal of stannous tin with ceric sulfate before the titration of ferrous iron.

14213* (English.) **The Separation of Beryllium From Iron, Aluminium and Titanium by Ion Exchange, and Its Application to the Analysis of Beryl.** M. N. Nadkarni, M. S. Varde, and V. T. Athavale. *Analytica Chimica Acta*, v. 16, May 1957, p. 421-425.

14214* (English.) **The Determination of Nitrate and Chloride in Sodium Hydroxide Solutions by Means of Cation Exchangers, in the Manufacturing Control of Alkaline Batteries.** Gunnar Gabrielson and Bengt Andersson. *Analytica Chimica Acta*, v. 16, May 1957, p. 425-427.

Depends on an ion exchange agent to neutralize the NaOH.

14215* (English.) **A Comparative Study of Different Methods of Determining Exchangeable Cations From Clays and Micas.** S. P. Mitra and Dharam Prakash. *Analytica Chimica Acta*, v. 16, May 1957, p. 431-435.

14216* (English.) **The Determination of Cobalt in Cobalt-Platinum Alloys.** D. H. Wilkins and L. E. Hibbs. *Analytica Chimica Acta*, v. 16, May 1957, p. 449-451.

Recommends separation and analysis of Co-Pt alloys by ion exchange or hydrazine reduction.

14217* (English.) **Rapid and Accurate Titrations With a Convenient and Compact Automatic Derivative Spectrophotometric Titrator.** H. V. Malmstadt and D. A. Vassallo. *Analytica Chimica Acta*, v. 16, May 1957, p. 455-463.

A device for automatically performing a wide variety of the well-known color indicator titrations.

14218* Bibliography of Polarographic Literature, 1922-1955. 192 p. 1956. E. H. Sargent & Co., Chicago. (Z5524.E39 S73b Ref.)

Includes 6815 references and an extensive subject index.

14219* (English.) **Quantitative Determination of 0.5-5 μg of Amino Acid Nitrogen on Paper Chromatograms and in Solution.** H. L. Kornberg and W. E. Patey. *Biochimica et Biophysica Acta*, v. 25, July 1957, p. 189-193.

The accuracy of a single determination is of the order of ± 5% at levels of 0.05-1 μg N, but is ± 2% when quantities of 1.5-5 μg N are determined.

14220* The Determination of Aluminium in Cast Iron and Ferro-Silicon by the Fluoride Volumetric Method. W. E. Clarke and R. C. Rooney. *British Cast Iron Research Association, Journal of Research and Development*, v. 6, June 1957, p. 666-669.

14221 Direct Titration of Calcium and Magnesium in Open-Hearth and Blast-Furnace Slags With the Disodium Salt of Ethylenediaminetetracetic Acid. I. N. Bazilevskaya. *Henry Brutcher Translation No.* 3896, 3 p. (From *Zavodskaya Laboratoriya*, v. 22, no. 2, 1956, p. 166-167.) Henry Brutcher, Altadena, Calif.

14222 Colorimetric Determination of Phosphorus in 10-20% Chromium Steels. E. A. Nechaeva and E. S. Lapidus. *Henry Brutcher Translation No.* 3897, 3 p. (From *Zavodskaya Laboratoriia*, v. 22, no. 4, 1956, p. 418.) Henry Brutcher, Altadena, Calif.

Simplified method using a Co salt instead of Ag as a catalyst is suitable for determining P in heat-resisting steels containing 0.015 to 0.035% P.

14223 Application of Objective Photometric Interpolation to Determination of Elements in High Concentrations in the Spectroanalysis of Multi-Component Alloys. I. A. Grikit. *Henry Brutcher Translation No.* 3905, 4 p. (From *Zavodskaya Laboratoriia*, v. 22, no. 2, 1956, p. 196-198.) Henry Brutcher, Altadena, Calif.

Use of microphotometer for making rapid analyses of heats of alloy steels.

14224 Determination of Small Contents of Aluminum in Steel. II. A. Neuberger and E. Schöffmann. *Henry Brutcher Translation No.* 3934, 6 p. + 1 plate. (From *Archiv f. d. Eisenhüttenwesen*, v. 28, nos. 2, 1957, p. 65-66.) Henry Brutcher, Altadena, Calif.

By applying the concentration procedure proposed by Zoerner before determining Al by the caustic soda method, the loss of Al can be reduced from 25 to 3%.

14225 Analysis of Ammonium Nitrate. I. Determination of Moisture. R. F. Muraca and Stephen P. Vango. *California Institute of Technology, Jet Propulsion Laboratory, Progress Report No.* 20-310, Mar. 1957, 29 p. (TL501 C12p Contin.)

Details of a new apparatus which permits complete drying of NH_4NO_3 and the accurate determination of moisture content. Factors affecting determination of water in NH_4NO_3 containing ZnO.

14226* (German.) Microanalysis by Means of Ion Exchange Resins. **Mikroanalyse mit Hilfe von Ionenaustauscherharzen. XII.** Determination of Nickel in 0.001 γ Amounts With Rubeanic Acid. **Über den Nachweis in Tausendstelgammenge vorhandenen Nickels mit Rubeanwasserstoffsäure. XIII.** Determination of Cobalt in 0.001 γ Amounts With Nitroso-R-Salts. **Über den Nachweis in Tausendstelgammamenge vorhandenen Kobalts mit Nitroso-R-salze. XIV.** Determination of Iron in 0.001 γ Amounts With 2,2′-Bipyridyl. **Über den Nachweis in Tausendstelgammamenge vorhandenen Eisens mit 2,2′-Bipyridyl.** Masatoshi Fujimoto. *Chemical Society of Japan, Bulletin*, v. 30, Apr. 1957, p. 274-287.

14227* Measurement of Uric Acid in Biologic Fluids Using an Ion-Exchange Separation. Bernard Shapiro, David Seligson, and Ralph Jessar. *Clinical Chemistry*, v. 3, June 1957, p. 169-177.

Method involves isolation of uric acid by an ion-exchange separation and quantitative determination of uric acid in the eluate by ultraviolet absorption, the Folin-Brown method, or an enzymatic technique.

14228* Photometric Procedure for Determining Esterase Activity. Harold A. Ramsey. *Clinical Chemistry*, v. 3, June 1957, p. 185-194.

Procedure for determining the esterase content of biologic tissues and fluids is sensitive to very small amounts of esterase, and the stability of its color is excellent if proper precautions are taken.

14229* (German.) Spectrophotometric Investigation of Complexes of Titanium With Chromotropic Acid and 1,8-Dihydroxynaphthalene. **Spektrophotometrische Untersuchung von Komplexen des Titans mit Chromotropsäure und 1,8-Dihydroxynaphthalin.** A. Okáč and L. Sommer. *Collection of Czechoslovak Chemical Communications*, v. 22, Apr. 1957, p. 433-452.

Determination of some complex compounds, the gradual transition of which depends on the concentration of components and on the pH of solution. Chromotropic acid gave the best results for the selective detection of Ti.

14230* (German.) Functional-Analytical Group for Titanium. **Funktionsanalytische Gruppe für Titan.** A. Okáč and L. Sommer. *Collection of Czechoslovak Chemical Communications*, v. 22, Apr. 1957, p. 464-467.

Reactions of some aliphatic and aromatic hydroxy compounds as indicators for Ti.

14231 Radioactivity Analyzes Liquids and Gases. Vigo N. Smith. *Control Engineering*, v. 4, Aug. 1957, p. 86-93.

Measurements of ionization and absorption help determine gas concentration in a binary mixture, H content in a liquid, and gross density in liquids and slurries.

14232 Time Savers in Brass Analysis. C. Goldberg. *Foundry*, v. 85, Aug. 1957, p. 102-104.

Some time-saving procedures for determining Pb, Sn, P, Sb, Al, and S in brass.

14233 Analysis of the Inorganic Constituents of Coal by Photometric Methods. W. J. S. Pringle. *Fuel*, v. 36, July 1957, p. 257-276.

Determination of the ten major inorganic constituents.

14234* Isotopic Standards for Carbon and Oxygen and Correction Factors for Mass-Spectrometric Analysis of Carbon Dioxide. Harmon Craig. *Geochimica et Cosmochimica Acta*, v. 12, nos. 1-2, 1957, p. 133-149.

The O isotopic composition of CO_2 produced by combustion of C was studied, and the derived correction factors for C measurements were checked experimentally by varying the O-18 content of CO_2.

14235 Neutron Activation Analysis. M. J. Cabell. *Industrial Chemist*, v. 33, July 1957, p. 345-351.

Principles underlying neutron activator analysis, experimental methods now in use, and some typical applications.

14236* Rapid Determination of Zinc, Calcium and Magnesium in Rubber Vulcanisates. C. M. Robertson. *Institution of the Rubber Industry, Transactions*, v. 33, June 1957, p. 97-100.

A rapid routine method for determining Zn, Ca, and Mg in the ash obtained from vulcanized rubber.

14237 Modern Trends in Metallurgical Analysis. W. T. Elwell. *Iron & Steel*, v. 30, July 1957, p. 347-353.

Emission spectrography; mass spectroscopy; X-ray fluorescence; atomic absorption spectra; spectrophotometry; radioactivation methods; homogeneous precipitation; analysis of solid samples.

14238 Colorimetric Microdetermination of the Acaricide 4,4'-Dichloro-Alpha-(Trichloromethyl)Benzhydrol (FW-293). Isadore Rosenthal, G. J. Frisone, and F. A. Gunther. *Journal of Agricultural and Food Chemistry*, v. 5, July 1957, p. 514-517.

Under optimum conditions, the method responds to 10 γ of FW-293 with 99% efficiency, in the presence of various fruit and nut extractives.

14239 Ultraviolet Spectrophotometric Microdetermination of the Acaricide 4,4'-Dichloro-Alpha-(Trichloromethyl)Benzhydrol (FW-293). F. A. Gunther and R. C. Blinn. *Journal of Agricultural and Food Chemistry*, v. 5, July 1957, p. 517-519.

The *p,p'*-dichlorobenzophenone may be determined quantitatively, directly by its absorption at 264 mμ or indirectly by the absorption of its 2,4-dinitrophenylhydrazone in alcoholic alkali at 510 mμ.

14240 Quantitative Ionophoretic Determination of Some Whey Proteins in Skim Milk. Abraham Leviton. *Journal of Agricultural and Food Chemistry*, v. 5, July 1957, p. 532-538.

Studies with α-lactalbumin and β-lactoglobulin, singly and in mixtures, show that recovery is quantitative if a precoat of β-lactoglobulin is applied ionophoretically.

14241 The Microdetermination of Dissolved Oxygen in Water. I. The Nature of the Problem. II. The Design of Water-Sampling Vessels. E. C. Potter. **III. Titrimetric Determination of Iodine in Submicrogramme Amounts. IV. Test of Winkler's Reaction to Below 0·001 p.p.m. of Dissolved Oxygen.** E. C. Potter and J. F. White. *Journal of Applied Chemistry*, v. 7, June 1957, p. 285-328.

Methods available for the determination of low concentrations (of the order of 0.01 p.p.m.) of dissolved O in water are critically reviewed and methods of assessing their accuracy are discussed. The Winkler method with an amperometric finish for the iodimetric titration is advocated with amendments to avoid errors caused by the presence of interfering substances in the water sample and in the reagents used.

14242 The Analytical Examination of Mixtures of Adipic, Sebacic and Phthalic Acids. M. Clasper and J. Haslam. *Journal of Applied Chemistry*, v. 7, June 1957, p. 328-332.

Chromatographic separation is effected on a silicic acid column buffered to pH 4.3, and the appropriate *n*-butanol/chloroform eluates are titrated with standard alkali.

14243 Identification of Alkylthio Groups by Infrared Spectroscopy. Andrew Menefee, Dorman O. Alford, and C. B. Scott. *Journal of Organic Chemistry*, v. 22, July 1957, p. 792-795.

Characteristic absorption bands were found for CH_3S-, C_2H_5S-, *n*-C_3H_7S-, *i*-C_3H_7S-, and *n*-C_4H_9S- groups in a study of the infrared spectra of mercaptans, sulfides, disulfides, and alkyl phosphorothioate compounds.

14244 *p*-Phenylazobenzoyl Chloride for Identification and Chromatographic Separation of Colorless Compounds. III. Phenols. E. O. Woolfolk and J. M. Taylor. *Journal of Organic Chemistry*, v. 2, July 1957, p. 827-829.

14245* Precise Intercomparison of Acids by Differential Potentiometric Titration With Hydrogen Electrodes. Roger G. Bates and Edward Wichers. *Journal of Research, National Bureau of Standards*, v. 59, July 1957, p. 9-17.

The purity of two preparations of benzoic acid, three of oxalic acid, and three of potassium hydrogen phthalate were compared by a precise determination of the equivalence of each substance with the same solid reference base, Na_2CO_3.

14246* Bromometric Determination of Cinnamic Acid & Its Derivatives. M. R. Verma, K. C. Agrawal, and S. D. Paul. *Journal of Scientific & Industrial Research*, v. 16, sec. B, May 1957, p. 213-215.

Effects of acidity, temperature, and excess of brominating agent were examined. Cinnamic acid and *m*-coumaric acid absorb an integral number of Br atoms.

14247* The Volumetric Determination of Phosphates and of Metals in the Presence of Phosphates. II. The Complexometric Determination of Several Metals in the Presence of Phosphate With Dithizone as Indicator. G. M. Lukaszewski, J. P. Redfern, and J. E. Salmon. *Laboratory Practice*, v. 6, July 1957, p. 389-391.

The method was examined for the estimation of the following metal ions: Co^{2+}, Ga^{3+}, In^{3+}, Zn^{2+}, Cd^{2+}, Hg^{2+}, Cu^{2+}, Bi^{3+}, Th^{4+}, and La^{3+}.

14248 Some Recent Advances in the Analysis of Cast Iron and Foundry Materials. W. E. Clarke. *Metallurgia*, v. 56, July 1957, p. 47-52.

Sampling; R. F. heating for combustion carbon determination; rapid methods for Mg; trace elements in cast iron; Al in cupola slags and cast iron.

14249* (English.) **Microdetermination of Halogens. A Zinc Absorption Method.** W. J. Kirsten. *Mikrochimica Acta*, nos. 3-4, 1957, p. 289-295.

A method for the determination of halogens by dry combustion, absorption in metallic Zn and potentiometric titration. Chlorine, Br, and I as well as their H and O compounds are quantitatively absorbed by granulated Zn at 50 C in a flow of moist O.

14250* (Spanish.) New Microchemical Reactions of Piperazine and Lycetal and Their Microanalytical Application. **Sobre nuevas reacciones microquimicas de la piperacina y del licetol y su aplicación microanalitica.** Benjamin Berisso. *Mikrochimica Acta*, nos. 3-4, 1957, p. 296-305.

Using potassium iodobismuthate both materials can be detected in any mixture no matter what their proportions since the compounds formed differ with respect to crystal form, color, and detection sensitivity.

14251* (German.) Direct Microanalytical Determination of Oxygen in Organic Compounds. **Beitrag zur direkten mikroanalytischen Bestimmung des Sauerstoffes in organischen Verbindungen.** K. Burger. *Mikrochimica Acta*, nos. 3-4, 1957, p. 313-317.

The Unterzaucher method is modified in that the carrier gas is not pure N but pure H. This permits the direct determination of O in all S-bearing organic compounds, also in metallo-organics and metal salts, provided the metal components can be released from their oxides by H.

14252* (German.) Microanalytic and Polarographic Determination of Thallium Traces. **Die mikromassanalytische und polarographische Bestimmung von Thalliumspuren.** F. A. Pohl and K. Kokes. *Mikrochimica Acta*, nos. 3-4, 1957, p. 318-325.

A critical review of the possibilities of isolating traces of Tl.

14253* (English.) **Chemical Analysis on the Microgram Scale. V. Separation and Identification of Cerium, Thorium, Lead, Calcium, Strontium, and Barium.** Jean K. Thompson and Cecil L. Wilson. *Mikrochimica Acta*, nos. 3-4, 1957, p. 334-340.

14254* (German.) Organic Spot Test Analysis. **Beiträge zur organischen Tüpfelanalyse.** F. Feigl, V. Gentil, and C. Stark-Mayer. *Mikrochimica Acta*, nos. 3-4, 1957, p. 341-353.

Methods for the detection of anthroquinone-sulfonic acids, secondary alcohols, succinic acid and succinimide, 1,2-diketones, α-alanine, chloranil, and naphthalene.

14255* (German.) Microdetermination of Sulfur According to Zimmermann. **Beitrag zur Mikrobestimmung des Schwefels nach Zimmermann.** A. Dirscherl. *Mikrochimica Acta*, nos. 3-4, 1957, p. 421-426.

In the titration method for determining S erroneously high values may be obtained because of even relatively brief exposure to unfavorable pH ranges during the oxidation of CdS to elementary S.

14256* (German.) Identification of Local Anaesthetics. **Zur Identifizierung der Lokalanästhetica.** M. Brandstätter-Kuhnert and H. Grimm. *Mikrochimica Acta*, nos. 3-4, 1957, p. 427-447.

A scheme of analysis for 28 local anaesthetics is based on the identification of derivatives by determining the micro-melting point.

14257* (German.) Iodometric Micro- and Ultramicro-Method of Determining Carbon and Hydrogen. Determination of the C:H Relationship Without Weighing. **Über die jodometrische Mikro- und Ultramikro-C-H-Bestimmung. Die Bestimmung des Verhältnisses C:H ohne Wägung.** Josef Unterzaucher. *Mikrochimica Acta*, nos. 3-4, 1957, p. 448-468.

14258* (German.) Rapid Determination of Microgram Quantities of Uranium in Minerals. **Schnellbestimmung von Mikrogrammengen Uran in Mineralen.** J. Korkisch, M. R. Zaky, and F. Hecht. *Mikrochimica Acta*, nos. 3-4, 1957, p. 485-495.

In a HNO_3 solution saturated with NH_4NO_3 the uranyl ion forms a negatively charged uranyl nitrate complex which is retained quantitatively by a strong basic anion exchanger. Uranium is determined quantitatively by a polarographic procedure employing the catalytic nitrate wave.

14259* (English.) **Heating in a Stream of Oxidizing or Reducing Gas for the Qualitative Analysis of Inorganic Substances.** A. A. Benedetti-Pichler and Herbert E. Schneider. *Mikrochimica Acta*, nos. 3-4, 1957, p. 567-571.

Observation of the phenomena resulting from heating a substance first in air and then in H is recommended for the preliminary examination of small specimens of inorganic matter.

14260* (German.) Microdetermination of Nicotine in Tobacco. **Mikrochemische Bestimmung des Nikotins in Tabak.** G. Gorbach and H. Kögler. *Mikrochimica Acta*, nos. 3-4, 1957, p. 572-576.

The nicotine after alkalization and distillation, is precipitated with picric acid and the excess of picric acid is determined iodometrically.

14261 Simplified Micro-Gas Analysis. Robert F. Dale. *Modern Packaging*, v. 30, July 1957, p. 151-152.

Revised reaction chamber and improved methodology give more uniform results in the testing of N atmosphere pouches.

14262 The Chemical Analysis of Zirconium and Zircaloy Metals. E. B. Read and H. M. Read. *Nuclear Metals, Inc. (U. S. Atomic Energy Commission)*, NMI-1171, Jan. 1957, 108 p. (UF767 Un3.1nm Contin.)

Recently developed procedures for determining 24 impurity elements in Zr are outlined.

14263 Use of Ion Exchange Resins to Concentrate Radionuclides for Subsequent Analysis. Bernd Kahn, Edwin R. Eastwood, and William J. Lacy. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2321, June 1957, 17 p. (UF767 U30 Contin.)

The concentration and subsequent radiochemical analysis of Cs, Sr, Ce, and Co in river water by ion exchange was found to be feasible.

14264 Paper Chromatography of Polyols and Dibasic Acids, and Its Application to the Analysis of Alkyd Resins. A. R. H. Tawn and G. J. May. *Oil & Colour Chemists' Association, Journal*, v. 40, July 1957, p. 528-543.

14265* Separation of Terpeneless Essential Oils by the Chromatographic Method. J. B. S. Braverman and Leora Solomiansky. *Perfumery and Essential Oil Record*, v. 48, June 1957, p. 284-287.

The method is based on the principle that, if the smallest component of the mixture is the most valuable one, the separation may be continued as long as the adsorbtive capacity of the column is not exhausted for this particular component.

14266 Apparatus for Remote, Small Scale, Liquid-Liquid Extractions. Fred W. Dykes and Richard G. Masterson. *Phillips Petroleum Co., Idaho Operations Office (U. S. Atomic Energy Commission)*, IDO-14409, June 1957, 10 p. (UF767 Un3.1id Contin.)

Apparatus is used in the preparation of highly radioactive sample aliquots for conventional analysis.

14267* Some Problems Associated With Determining Iron in Plants. D. J. D. Nicholas, C. P. Lloyd-Jones, and D. J. Fisher. *Plant and Soil*, v. 8, May 1957, p. 367-377.

Iron is present as a serious contaminant on leaf surfaces; it may be removed completely by washing the plants in water containing a detergent without loss of the trace metal from within the tissues.

14268* (Italian.) Flame Photometry in the Analysis of Natural Waters. **La fotometria di fiamma nell'analisi delle acque naturali. I.** Sodium Determination. **Determinazione del sodio. II.** Potassium Determination. **Determinazione del potassio.** Piero Valori and Franco Savoini. *Ricera Scientifica*, v. 7, Mar. 1957, p. 791-813; Apr. 1957, p. 1204-1215.

The adaptation of a method for Na determination in natural waters to K determination concerns only the composition of the "spectrochemical buffer", to be added to the standards and samples of the water examined. This method permits the determination of K concentrations up to a minimum of 0.1 to 0.05 p. p. m.

14269 Semimicro Qualitative Organic Analysis. Nicholas D. Cheronis and John B. Entrikin. 2nd Ed. 774 p. 1957. Interscience Publishers, New York. (QD271 C42s2)

The systematic identification of organic compounds.

14270* (English.) **The Rapid and Accurate Determination of Sulphur in Pyrites by the Combustion Method.** A. Mendelowitz. *South African Chemical Institute, Journal*, v. 10, Apr. 1957, p. 36-39.

The pyrites, mixed with kieselguhr to prevent sintering, is burned in a stream of O at about 950 C. The combustion products are absorbed in dilute H_2O_2 and the H_2SO_4 formed titrated.

14271* The Direct-Reading Spectrometric Analysis of Alloy Cast Iron. Roger Bartel and Alan Goldblatt. *Spectrochimica Acta*, v. 9, no. 3, 1957, p. 227-234 + 1 plate.

Excitation conditions have been established which eliminate the metallurgical effects of carbon in the emission spectrometric analysis of iron and steel by the point-to-plane technique.

14272* (Norwegian.) Slag Analyses. **Om slagganalyser.** Sigurd Velken. *Tidsskrift for Kjemi, Bergvesen og Metallurgi*, v. 17, no. 2, 1957, p. 20-23.

Importance of slag composition in production of pig iron, steel, and ferro-alloys; sampling and preparing specimens; decomposition; different methods to determine basicity and composition.

14273 Measurement of Composition of Freon 12—Freon 22 Mixtures With a Thermal Conductivity Gas Analyzer. H. S. McKown. *Union Carbide Nuclear Company (U. S. Atomic Energy Commission)*, K-1318, May 1957, 12 p. (UF767 Un3.1k Contin.)

14274 Special Applications Line Recorder Mass Spectrometer for Isotope Analysis. R. H. Stevens. *Union Carbide Nuclear Company (U. S. Atomic Energy Commission)*, K-1334, June 1957, 23 p. (UF767 Un3.1k Contin.)

A mass spectrometer was modified to determine isotopic abundance ratios for O, N, A, and other elemental gases whose mol. wt. is less than 50.

14275 Sequential Analysis of Tracer Amounts of Np, U and Pu in Fission-Product Mixtures by Anion Exchange. L. Wish and M. Rowell. *U. S. Naval Radiological Defense Laboratory, Research and Development Technical Report*, USNRDL-TR-117 NS 081-001, Oct. 1956, 30 p. (QC475 Un3.5r Contin.)

Elution characteristics of Np, Pu, U, and Zr in HCl, HNO_3, and H_2SO_4 media with Dowex-2 anion resin.

14276* (Russian.) Extraction as a Method of Physical-Chemical Analysis. **Ekstragirovanie kak metod fiziko-khimicheskogo analiza.** I. M. Korenman and F. R. Sheianova. *Zhurnal Analiticheskoi Khimii*, v. 12, May-June 1957, p. 285-295.

A radioisotope investigation of a series of problems in the extraction from very dilute solutions and in the extraction of faintly colored or colorless reaction products.

14277* (Russian.) The Effect of Silica Gel Moisture Content on the Chromatographic Separation of Gases. **Vliianie vlazhnosti silikagelia na khromatograficheskoe razdelenie gazov.** N. M. Turkel'taub, A. I. Koliubiakina, and M. S. Selenkina. *Zhurnal Analiticheskoi Khimii*, v. 12, May-June 1957, p. 302-312.

Irreversible absorption of unsaturated hydrocarbons on silica gel is mainly due to the presence of H_2SO_4.

14278* (Russian.) Device for Microanalysis of Inert Gases. **Pribor dlia mikroanaliza inertnykh gazov.** K. P. Florenskii. *Zhurnal Analiticheskoi Khimii*, v. 12, May-June 1957, p. 332-337.

Permits working in a range of gas volumes from 200 to 10^{-6} ml.

14279* (Russian.) Determination of Oxygen, Hydrogen, and Nitrogen in Molybdenum, Tungsten, and Niobium. **Opredelenie kisloroda, vodoroda i azota v molibdene, vol'frame i niobii.** G. V. Mikhailova, Z. M. Turovtseva, and R. Sh. Khalitov. *Zhurnal Analiticheskoi Khimii*, v. 12, May-June 1957, p. 338-341.

The vacuum-fusion method with an Fe bath is used.

14280* (Russian.) Determination of Niobium in the Presence of Large Amounts of Titanium. **Opredelenie niobiia v prisutstvii bol'shikh kolichestv titana.** A. I. Ponomarev and A. Ia. Sheskol'skaia. *Zhurnal Analiticheskoi Khimii*, v. 12, May-June 1957, p. 355-358.

Method is based on the precipitation of Nb with tannin.

14281* (Russian.) Determination of Monovalent Thallium by Means of Radiometric Titration With Sodium Tetraphenylboron. **Opredelenie odnovalentnogo talliia metodom radiometricheskogo titrovaniia tetrafenilbornatriem.** I. A. Sirotina and I. P. Alimarin. *Zhurnal Analiticheskoi Khimii*, v. 12, May-June 1957, p. 367-371.

A semi-micro determination by means of radiometric titration at pH 4-5 with Tl^{204}.

14282* (Russian.) Separation of Titanium From Accompanying Elements by Ion-Exchange Chromatography. **Otdelenie titana ot soputstvuiushchikh elementov metodom ionoobmennoi khromatografii. II.** Separation of Titanium and Chromium. **Razdelenie titana i khroma.** I. P. Alimarin, T. A. Beliavskaia, and L. A. Bazhanova. *Zhurnal Analiticheskoi Khimii*, v. 12, May-June 1957, p. 377-380.

Separation of Ti and Cr at the ratios Ti : Cr from 1 : 100 to 10,000 : 1 with a 0.5% solution of complexone III.

14283* (Russian.) Titrimetric Method for the Simultaneous Determination of Chlorine, Bromine, and Iodine Ions. **Titrimetricheskii metod opredeleniia ionov khlora, broma, i ioda v ikh smesi.** A. S. Vorob'ev. *Zhurnal Analiticheskoi Khimii*, v. 12, May-June 1957, p. 395-397.

14284* (Russian.) Methods for Isotopic Analysis of Water. **Metody izotopnogo analiza vody. IV.** A Method for Complete Isotopic Analysis of Water. **Metod polnogo izotopnogo analiza vody.** A. I. Shatenshtein, E. A. Iakovleva, S. F. Suzdal'tseva, and N. P. Antipova. *Zhurnal Analiticheskoi Khimii*, v. 12, May-June 1957, p. 398-401.

A semi-micro analysis based on the measurement of water density by a drop method, before and after normalization of the isotopic composition of O in the water.

14285* (Russian.) Iodochlorometric Determination of Barbituric Acid Derivatives. **Iodkhlorometricheskoe opredelenie proizvodnykh barbiturovoi kisloty.** L. I. Rapaport. *Zhurnal Analiticheskoi Khimii*, v. 12, May-June 1957, p. 415-419.

14286* (Russian.) Polarographic Study of Monomers of Methacrylic Acid. **Poliarograficheskoe izuchenie monomerov efirov metakrilovoi kisloty.** V. D. Bezuglyi and V. N. Dmitrieva. *Zhurnal Prikladnoi Khimii*, v. 30, May 1957, p. 744-750.

Basic polarographic constants for methyl, ethyl, butyl, and allyl esters of methacrylic acid. Applications of the polarographic method in determination of monomers in plastics soluble in organic solvents in the presence or absence of dibutyl phthalate plasticizer.

See also: **14117** (analysis of algae); **14340** (determination of eleostearic acids); **14390** (identification of organic compounds); **14621** (polarography of quinalizarine complexes); **14623** (estimation of tungstate ion); **14967** (determination of boron); **15171** (detection of H in U).

CHEMISTRY—INORGANIC AND GENERAL

14287* (German.) Reaction of Hydrogen Peroxide With Hypohalogenites in Alkaline Media. **Über die zwischen Wasserstoffperoxyd und Hypohalogeniten in alkalischem Medium verlaufende Reaktion.** L. Erdey and J. Inczédy. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 11, nos. 1-2, 1957, p. 125-135.

The kinetics of the reaction of H_2O_2 and various hypohalogenites were investigated at different concentrations of H ions, with special regard to the alkaline domain.

14288 The Synthesis of Certain Ethylenediamineplatinum (II) and (IV) Bromides and Iodides. George W. Watt and Robert E. McCarley. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3315-3317.

14289 Preparation and Characterization of a New Crystalline Form of Molybdenum Disulfide. Ronald E. Bell and Robert E. Herfert. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3351-3354.

Single crystal X-ray examination of synthetic MoS_2 revealed a hitherto unreported rhombohedral form.

14290 Complexes Formed Between Copper(II) Ion and N,N,N',N'-trakis-(2-Hydroxypropyl)-Ethylenediamine. James L. Hall, F. Robert Jones, C. Eugene Delchamps, and Charles W. McWilliams. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3361-3364.

14291 The Mechanism of Formation of Sodium Triphosphate From Orthophosphate Mixtures. James W. Edwards and Arno H. Herzog. *American Chemical Society, Journal*, v. 79, July 20, 1957, p. 3647-3650.

The condensation reactions which take place when mixtures of sodium orthophosphates, having a mole ratio Na_2O/P_2O_5 of 5/3, are heated to higher temperatures were investigated by means of thermal analysis, X-ray diffraction, chromatographic analysis, and wet-chemical analysis coupled with dehydration studies.

14292 The Hydrolysis of Plutonium (IV). Sherman W. Rabideau. *American Chemical Society, Journal*, v. 79, July 20, 1957, p. 3675-3677.

14293 The Composition and Formation of Cobalt Complexes With 1-Nitroso-2-Naphthol. I. M. Kolthoff and Einar Jacobsen. *American Chemical Society, Journal*, v. 79, July 20, 1957, p. 3677-3681.

14294* (French.) Preparation of Iodides by the Action of Melted Aluminum Iodide on Oxides. **Préparation des iodures par action de l'iodure d'aluminium fondu sur les oxydes.** Marcel Chaigneau. *Bulletin de la Société Chimique de France*, no. 7, July 1957, p. 886-888.

Preparation of iodides by action of iodine or of hydriodic acid on the element, on its binary compounds, or on oxygenated ternary compounds. Table shows elements used, reactions, time and temperature, compounds obtained, and method used in isolating the iodide in each case. Observations made during the preparation of Sb, Ag, As, B, Cr, Fe, Mo, Nb, Ta, rare earths, Th, W, V, and Zr iodides. Analytical results were not satisfactory in the case of B and Cr.

14295* (French.) Transformations of Mixed Crystals of Cuprous Iodomercurate and of Silver Iodomercurate. **Étude des transformations de cristaux mixtes d'iodomercurate cuivreux et d'iodomercurate d'argent.** Jean Jaffray and Roland Jouanisson. *Comptes Rendus*, v. 245, July 1, 1957, p. 40-41.

The nature (first or second order) of the transformation of the mixed crystals of both iodomercurates depends on the composition. The properties of these crystals do not correspond at all to the law of mixtures, hence great structural differences are possible between both pure salts. On heating only one transformation of the mixed crystal appears above ordinary temperatures and up to 100 C. Variations: in mixtures containing 0 to 0.28 moles of HgI_4Cu_2 per mole of HgI_4Ag_2 the transformation temperature regularly decreases from 50 to 36 C. Between 0.28 and 0.50 moles of HgI_4Cu_2 the transformation temperature remains very close to 36 C (about 1 degree). Between 0.50 and 0.68, it rapidly increases from 36 to 57 C. Between 0.68 and 1, it increases regularly from 57 to 72 C.

14296 The Boron Hydrides. Bernard Siegel and Julius L. Mack. *Journal of Chemical Education*, v. 34, July 1957, p. 314-317.

Preparation and properties of the entire family.

14297* (Hungarian.) Why Does the Temperature Coefficient of the Thermodynamic Normal Potential of the Reaction in the Production of Carbon Monoxide Differ From the Coefficients for the Production of Other Metal Oxides? **Miért tér el a szénmonoxidképződésre vonatkozó reakció termodinamikai normálpotenciáljának hőmérsékleti együtthatója a többi fémoxidra vonatkozótól?** József Wéber. *Kohászati Lapok*, v. 12, Mar. 1957, p. 105-108.

Explanation of the contradiction between the assumption that the reaction rate increases with increasing temperatures and the theory of partial pressures.

14298 The Preparation of High-Purity Thorium Oxide. Robert N. Roberts. *Los Alamos Scientific Laboratory (U. S. Atomic Energy Commission)*, LA-1934, June 1957, 22 p. (UF767 U3La Contin.)

Thorium oxide prepared by the method described has the requisite purity, homogeneity, and reproducibility for use as matrix material for spectrochemical standards.

14299 The Sublimation of Uranyl Fluoride in the Presence of Hydrogen Fluoride. Richard E. DeMarco, Robert C. Abbott, DuWane C. Bonfer, and Paul A. Cook. *National Lead Company, Inc., Feed Materials Production Center (U. S. Atomic Energy Commission)*, NLCO-671, Mar. 1957, 15 p. (UF767 Un3.InL Contin.)

Uranyl fluoride was found to sublime in the presence of HF at temperatures greater than 1000 F. The rate of sublimation was found to be 1.35 with respect to HF and to possess an activation energy of 23 ± 1 kcal./mole.

14300* (English.) **Preparation of Double Metal Sulphides of the Type AB_2S_4. I. Compounds of Titanium, Gold and Aluminium.** L. D. C. Bok and P. E. Odendaal. *South African Chemical Institute, Journal*, v. 10, Apr. 1957, p. 40-46.

Three double metal sulphides, $CuTi_2S_4$, $TiZr_2S_4$, and $TiAl_2S_4$ were prepared by heating the constituent elements in stoichiometric proportions in sealed evacuated silica tubes. Similar heating of other mixtures of elements with S or H_2S and Ti, Au, or Al, gave only binary sulfides.

14301* (English.) **Infra-Red Absorption Spectra of Inorganic Coordination Complexes. XI. Infra-Red Studies of Mercuric Amidobromide, $Hg(NH_2)Br$.** I. Nakagawa, R. B. Penland, S. Mizushima, T. J. Lane, and J. V. Quagliano. *Spectrochimica Acta*, v. 9, no. 3, 1957, p. 199-203.

Infra-red spectra of the cubic and rhombic modifications of $Hg(NH_2)Br$ were measured in the 2-35μ region. From the normal vibration calculation made for the $HgNH_2^+$ ion, the infra-red absorption bands of these modifications were assigned.

14302* (French.) The Infra-Red Spectrum of Solid Nitrous Oxide. **Spectre d'absorption infra-rouge du protoxyde d'azote à l'état solide.** Paul A. Giguère and Kenneth B. Harvey. *Spectrochimica Acta*, v. 9, no. 3, 1957, p. 204-207.

Three fundamentals, four overtones, and six combinations were observed. Four very weak bands are assigned to the isotopic molecules $N^{14}N^{15}O$ and $N^{15}N^{14}O$.

14303* (Russian.) Preparation of Deuterium Oxide and Determination of Its Density. **Poluchenie okisi deiteriia i opredelenie ee plotnosti.** A. I. Shatenshtein, L. M. Iakimenko, V. P. Kalinachenko, and E. A. Iakovleva. *Zhurnal Neorganicheskoi Khimii*, v. , May 1957, p. 985-994.

Equipment for preparation of deuterium oxide was constructed and samples of a high isotopic purity were obtained. Density of deuterium oxide was measured at 25, 30, 40, and 50 C.

14304* (Russian.) Cobaltammine Iodates. **Iodaty kobaltiamminov. II.** N. I. Lobanov. *Zhurnal Neorganicheskoi Khimii*, v. 2, May 1957, p. 1035-1039.

Synthesis of 15 compounds containing in the inner sphere the IO_3^- group, and study of certain qualities of newly prepared cobaltammine iodates.

14305* (Russian.) Reaction of Titanium With Lithium and Potassium Fluorides. **Vzaimodeistvie titanatov i ftoridov litiia i natriia. II-III.** I. N. Beliaev and N. P. Sigida. *Zhurnal Neorganicheskoi Khimii*, v. 2, May 1957, p. 1119-1133.

Studies of the systems Na_2TiO_3 - Li_2TiO_3, Na_2F_2 - Li_2TiO_3, Na_2TiO_3 - Li_2F_2, Li_2TiO_3 - K_2TiO_3, Li_2TiO_3 - K_2F_2, and K_2TiO_3-Li_2F_2.

14306* (Russian.) Study of Titanium and Ammonium Double Sulfates Developing Within the TiO_2-SO_3-$(NH_4)_2SO_4$-H_2O System. **Izuchenie dvoinykh sul'fatov titana i ammoniia, obrazuiushchikhsia v sisteme TiO_2-SO_3-$(NH_4)_2SO_4$-H_2O.** Ia. G. Goroshchenko and M. I. Andreeva. *Zhurnal Neorganicheskoi Khimii*, v. 2, June 1957, p. 1413-1419.

See also: **14143** (characteristics of BeO).

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14307* (English.) **The Kinetics of the Acid-Catalysed Solvolysis of Ethylal in Water-Ethanol Mixtures.** Pentti Salomaa. *Acta Chemica Scandinavica*, v. 11, no. 3, 1957, p. 461-467.

14308* (English.) **The Preparation of Thiocholine Esters.** Bertil Hansen. *Acta Chemica Scandinavica*, v. 11, no. 3, 1957, p. 537-540.

Ethylene sulfide was prepared and the thiocholine esters of acetic, propionic, *n*-butyric, *n*-valeric, and benzoic acids were synthesized in two ways.

14309* (German.) Polarographic Investigation of Glucosazones. **Polarographische Untersuchung des Glucosazons.** B. Jámbor and L. Mester. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 9, nos. 1-4, 1956, p. 485-492.

D-glucosazone, D-glucose-1-methylphenyl-2-phenyl-osazone, and D-glucose-bis-methylphenyl-osazone were studied.

14310* (English.) **Theoretical Examination of Condensed Aromatic Compounds. II. Terylene, Quaterylene and Teranthene.** *Acta Chimica Academiae Scientiarum Hungaricae*, v. 11, nos. 1-2, 1957, p. 63-71.

The first members of the poly-rylene and poly-anthene series were investigated relative to the behavior of bond length, free valence number, and absorption spectra. A survey of the spectral data shows that the rate of shifting of the maximum differs from that of the poly-acene series.

14311 The Effect of Various Solvents on the Carbonyl Absorption Spectrum of Glycidic Esters. Horton H. Morris and Raymond H. Young, Jr. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3408-3411.

14312 Liquid-Solid Countercurrent Distribution of Fatty Acids With Urea. W. N. Sumerwell. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3411-3415.

The reaction of fatty acids with urea to form inclusion adducts is used as the basis of a liquid-solid countercurrent distribution method for separating mixtures of fatty acids.

14313 Some Acyl Ferrocenes and Their Reactions. P. J. Graham, R. V. Lindsey, G. W. Parshall, M. L. Peterson, and G. M. Whitman. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3416-3420.

Formylcyclopentadienyl - (cyclopentadienyl) - iron was synthesized by reaction of ferrocene with N-methylformanilide. A number of new diacylferrocenes were also prepared by the Friedel-Crafts reaction.

14314 Organic Chemistry of Ferrocene. II. The Preparation of ω-Ferrocenyl Aliphatic Acids. Kenneth L. Rinehart, Jr., Ronald J. Curby, Jr., and Phillip E. Sokol. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3420-3424.

Ferrocenylacetic acid, β-ferrocenylpropionic acid, γ-ferrocenylbutyric acid, δ-ferrocenylvaleric acid, and ε-ferrocenylcaproic acid were synthesized. Synthetic methods employed include the Willgerodt reaction of ferrocenyl ketones, carbethoxylation of acetylferrocene and Friedel-Crafts acylations of ferrocene.

14315 Fluorocarbon Derivatives. I. Derivatives of Sulfur Hexafluoride. II. Cyclic Nitrides. Friedrich W. Hoffmann, et al. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3424-3432.

The electrofluorination of dialkyl and cyclic sulfides, dialkyl disulfides, and some secondary and tertiary cyclic amines in anhydrous HF by the Simons process was investigated.

14316 Neighboring Carbon and Hydrogen. XXIX. *p-σ* Analysis of Acetolysis of Substituted Neophyl Arylsulfonates. R. Heck and S. Winstein. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3432-3438.

Rates of aryl-assisted ionization of a series of substituted neophyl *p*-bromobenzenesulfonates were measured and correlated with the aid of the Hammett *p-σ* relation.

14317 Mechanisms of Elimination Reactions. XVIII. Reactivities of Some 2,3-Norbornane Derivatives. Stanley J. Cristol and Erhard F. Hoegger. **XIX. Elimination and Solvolytic Reactivities in Some Bicyclo [2,2,1] Heptane and Bicyclo [2,2,2] Octane Derivatives.** Stanley J. Cristol and Robert P. Arganbright. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3438-3443.

14318 Synthesis of 2,2-Dialkylcyclopropane Nitriles. Edward R. Nelson, M. Maienthal, L. A. Lane, and A. A. Benderly. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3467-3469.

14319 The Reaction of *t*-Butylethylene and 1-Hexene With Bromine in Methanol. W. H. Puterbaugh and Melvin S. Newman. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3469-3471.

The addition of Br in methanol to *t*-butylethylene produces 1,2 - dibromo-3,3-dimethylbutane and 2-bromo-1-methoxy-3,3-dimethylbutane in roughly equal amounts. The addition of Br in methanol to 1-hexene produces about 31% of 1,2-dibromohexane and 59% of a mixture of 1-bromo-2-methoxyhexane and 2-bromo-1-methoxyhexane in the ratio 4:1, respectively.

14320 Organic Peroxides. VI. Allyl Hydroperoxide. Stanley Dykstra and Harry S. Mosher. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3474-3475.

Compound was prepared in purified form by reaction of allyl methanesulfonate with H_2O_2 and methanolic KOH. It detonates on heating and decomposes on prolonged exposure to light at room temperature but is relatively stable in cold and dark.

14321 The Condensation of Grignard Reagents With 3-Pyridyl and 3-Quinolyl Ketones. Reynold C. Fuson and John J. Miller. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3477-3480.

14322 The Metalation of 4-*t*-Butyldiphenyl Sulfone With *n*-Butyllithium. David A. Shirley and Erwin A. Lehto. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3481-3484.

Metalation results in introduction of the Li atom in the positions *ortho* to the sulfone group, 69% of the metalation occurring in the unsubstituted ring and 31% in the ring containing the *t*-butyl group.

14323 The Preparation of Some 10-Substituted Phenoxazines. Henry Gilman and Leonard O. Moore. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3485-3487.

Improved procedure is applicable to the preparation of larger amounts than previously reported.

14324 The Preparation of Some Organic Diazides. Arniger H. Sommers and James D. Barnes. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3491-3492.

The polymethylene diazides containing five to ten C atoms and examples of other classes of organic diazides were prepared through displacement of halogen or arenesulfonoxy groups by the azide ion.

14325 New Analeptics. 1-Benzhydryl-2-Alkyl-2-Thiopseudoureas. Stanley O. Winthrop, Stella Sybulski, Gregory Gavin, and Gordon A. Grant. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3496-3500.

Synthesis of a series of S-alkylated benzhydrylthioureas. The lower members show analeptic properties.

14326 Reactions With Mercaptans. IV. Reaction of Aromatic Thiols With 3(2H)-Thianaphthenone-1,1-Dioxides and 2 - Benzylidene - 3(2H) - Thianaphthenone-1-1-Dioxide. Ahmed Mustafa and Salah Mohamed Abdel Dayem Zayed. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3500-3502.

14327 Synthesis of Methoxyhydrophenanthrenes and Methoxyhydrocyclohepta [a]-Naphthalenes by Acylation of Ketones With Homoveratric Anhydride. Gordon N. Walker. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3508-3514.

14328 Terpenoids. XXVIII. The Triterpene Composition of the Genus Myrtillocactus. Carl Djerassi, et al. **XXIX. Iresin. A New Fundamental Sesquiterpene Skeleton.** Carl Djerassi and Werner Rittel. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3525-3534.

14329 A Novel Resolution of Pantolactone—The Synthesis of D(+)-Calcium Pantothenate. Fred Kagan, Richard V. Heinzelman, David I. Weisblat, and Ward Greiner. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3545-3549.

14330 The Pyridylethylation of Indole and Related Reactions. Allan P. Gray and Wesley L. Archer. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3554-3559.

14331 Organic Phosphorus Compounds. I. The Conversion of the Chloroaluminate Complexes, $[RPCl_3]$ $[AlCl_4]$, to Alkyl Alkylphosphonochloridates and Diaklyl Alkylphosphonates. Friedrich W. Hoffmann, Thomas C. Simmons, and Louis J. Glunz. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3570-3575.

14332 Acetylium Perchlorate-Catalyzed Preparation of Ketones. The Use of Sodium Perchlorate-Acetyl Chloride Mixture in th Ring Acetylation of Phenol Ethers. K. B. L. Mathur, J. N. Sharma, K. Venkataramanan, and H. G. Krishnamurty. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3582-3586.

14333 Electronic Effects in Elimination Reactions. I. Pyrolysis of Acetates. C. H. DePuy and R. E. Leary. **II. The E_2 Reaction.** C. H. DePuy and D. H. Froemsdorf. *American Chemical Society, Journal*, v. 79, July 20, 1957, p. 3705-3711.

Pyrolytic eliminations of some acetates of substituted 1,3-diphenyl-2-propanols lead to the formation of that olefin which also predominates when the possible olefins are equilibrated, and not to the olefin which would be formed by loss of the most acidic hydrogen. The base-promoted elimination reaction of substituted β-phenylethyl halides, tosylates, and sulfonium salts was studied as a function of substituents.

14334 Imides From Asparagine and Glutamine. II. α-Aminoglutarimide. Ernest Sondheimer and Robert W. Holley. *American Chemical Society, Journal*, v. 79, July 20, 1957, p. 3767-3770.

Hydrogenolysis of carbobenzoxy-DL-α-aminoglutarimide in the presence of HCl yields DL-α-aminoglutarimide hydrochloride.

14335 Syntheses of Papaverine, Papaverinol and Papaveraldine From Reissert Compounds. Frank D. Popp and William E. McEwen. *American Chemical Society, Journal,* v. 79, July 20, 1957, p. 3773-3777.

Synthesis from 2-benzoyl-6,7-dimethoxy-1,2-dihydroisoquinaldonitrile.

14336 Structure of the Anhydrobromonitrocamphanes. Eugene E. van Tamelen and Joseph E. Brenner. *American Chemical Society, Journal,* v. 79, July 20, 1957, p. 3839-3846.

14337 Relative Reactivities of Polynuclear Aromatic Systems. The Solvolysis of α-Arylethyl Chlorides. Ernst Berliner and Nan Shieh. *American Chemical Society, Journal,* v. 79, July 20, 1957, p. 3849-3854.

14338 Proximity Effects. IV. Reaction of Cycloöctene Dibromide With Silver Acetate. Arthur C. Cope and Geoffrey W. Wood. **V. Reaction of Cycloöctene Dibromide With Tetraethylammonium Acetate.** Arthur C. Cope and Herbert E. Johnson. **VI. Stereospecific Syntheses of *cis*- and *trans*-1,4-Cycloöctanediols.** Arthur C. Cope and Burton C. Anderson. **VII. Stereospecific Syntheses of *cis*- and *trans*-1,5-Cycloöctanediols.** Arthur C. Cope and Albert Fournier, Jr. **VIII. Solvolysis of *cis*-Cycloöctene Oxide; Synthesis of Alcohols in the Cycloöctane Series.** Arthur C. Cope, Allen H. Keough, Paul E. Peterson, Howard E. Simmons, Jr., and Geoffrey W. Wood. **IX. Solvolysis of *trans*-Cycloöctene Oxide.** Arthur C. Cope, Albert Fournier, Jr., and Howard E. Simmons, Jr. *American Chemical Society, Journal,* v. 79, July 20, 1957, p. 3885-3909.

14339 Influence of High Energy Radiation on the Oxidation of Aleic Acid and Methyl Oleate. II. Sites of Oxygen Attack. Hal T. Slover and L. R. Dugan, Jr. *American Oil Chemists' Society, Journal,* v. 34, July 1957, p. 333-335.

Gamma radiation at the level used has no specific effect on the products of autoxidation.

14340 A Simplified Method for the Preparation of α- and β-Eleostearic Acids and a Revised Spectrophotometric Procedure for Their Determination. Joan S. Hoffman, R. T. O'Connor, D. C. Heinzelman, and W. G. Bickford. *American Oil Chemists' Society, Journal,* v. 34, July 1957, p. 338-342.

Preparation involves saponification of α- and β-tung oils under mild conditions, followed by direct crystallization of the liberated acids at −20 C from ethanolic solution.

14341* (German.) Chemical Syntheses of Intermediate Products of Sugar Metabolism. **Chemische Synthesen von Zwischenprodukten des Zuckerstoffwechsels.** Hermann O. L. Fischer. *Angewandte Chemie,* v. 69, June 21, 1957, p. 413-419.

Preparation of glucose-6-, D-glycerol-aldehyde-3-, dichydroxyacetone-, and L-α-glycerol phosphoric acids, also 3-phosphoglycerol, 2-phosphoglycerol, phosphopyruvic, and D-erythrose-4-phosphoric acids.

14342* (German.) Progress in the Field of Oligosaccharides. **Fortschritte auf dem Gebiet der Oligosaccharide.** Mary Grace Blair and W. Pigman. *Angewandte Chemie,* v. 69, June 21, 1957, p. 422-433.

Occurrence, properties, and syntheses.

14343* (German.) On Higher-Numbered Heterocyclic Rings. **Über höhergliedrige heterocyclische Ringe. I.** Formation of Substituted 1,2,4-Triaza-Cycloöctatetraene. **Die Bildung substituierter 1.2.4-Triaza-cyclooctatetraene.** Hans Beyer and Theodor Pyl. *Annalen der Chemie,* v. 605, nos. 1-3, 1957, p. 50-58.

Description of structure and reactions with proof, including IR spectrum, for the existence of this new type of heterocyclic eight-member ring.

14344* (German.) On the Effect of Metal-Organic Compounds on Chinols. **Über die Einwirkung metallorganischer Verbindungen auf Chinole. VIII.** On the Effect of the Grignard Compounds of Acetylene and Substituted Acetylenes on Chinol Acetates. **Über die Einwirkung der Grignard-Verbindungen des Acetylens und substituierter Acetylene auf Chinolacetate.** Friedrich Wessely and Erich Zbiral. *Annalen der Chemie,* v. 605, nos. 1-3, 1957, p. 98-110.

14345* (German.) Vanadium Complexes of Salicylaldoxime. **Vanadiumkomplexe des Salicylaldoxims.** Hans-Joachim Bielig and Heinz Möllinger. *Annalen der Chemie,* v. 605, nos. 1-3, 1957, p. 117-125.

Discussion of compounds, structures, reactions, and experimental procedures in the formation of V complexes of salicylaldoxime.

14346* Reactions of Aroyl Peroxides. III. Benzoyl Peroxide With Chlorobenzene, Naphthalene, and Nitrobenzene. B. M. Lynch and K. H. Pausacker. *Australian Journal of Chemistry,* v. 10, May 1957, p. 165-176.

Results of quantitative studies indicate that benzoyl peroxide is not a suitable reagent for evaluation of reactivities towards free radicals. Isomer ratios in the (mono-) phenylation and benzoloxylation of naphthalene by benzoyl peroxide are reported.

14347* (English.) **Molecular Rotations of Glucides in Relation to Their Structures. I. The Absolute Configuration of γ-Lactones. II. The Conformation and the Absolute Configuration of Aldopyranoses. Physical Meaning of Hudson's Isorotation Rule.** Shukichi Yamana. *Chemical Society of Japan, Bulletin,* v. 30, Apr. 1957, p. 203-210.

14348* Benzylation of Acetylene. I. Formation of 3,4-Diphenyl-1-Butyne and 3,4-Diphenyl-1,2-Butadiene. Teisuke Ando and Niichiro Tokura. *Chemical Society of Japan, Bulletin,* v. 30, Apr. 1957, p. 259-263.

Compounds were prepared with metallic Li and Na and liquid ammonia.

14349 The Chemistry of Organometallic Compounds. Eugene G. Rochow, Dallas T. Hurd, and Richard N. Lewis. 344 p. 1957. John Wiley & Sons, New York. (QD411 R58c)

Up-to-date information on structure, physical properties, preparation, chemical reactions, and applications.

14350* (French.) Synthesis of 3,3'- and 3,3',5'-Iodothyroacetic Acids and of 3-Iodo-Dl-Thyronine. **Synthèse des acides 3.3'- et 3.3'.5'-iodothyroacétiques et de la 3-iodo-DL-Thyronine.** Jean Roche, Raymond Michel, Jacques Nunez, and Claude Jacquemin. *Comptes Rendus,* v. 245, July 1, 1957, p. 77-80.

3-Iodothyroacetic acid was synthesized in five stages, starting from 3-iodo-4(4'-methoxyphenoxy) benzaldehyde. The di- and triiodinated derivatives were prepared by iodination of the first. 3-Iodothyronine was synthesized in four stages. Experimental data on intermediate products are tabulated.

14351* (Russian.) The Study of the Mechanism of Alkylation of Phenols by N-Trimethyl-α-Phenylethyl-Ammonium Iodide. **Issledovanie mekhanizma alkilirovaniia fenolov iodistym N-trimetil-α-fenetilammoniem.** D. N. Kursanov and S. V. Vitt. *Doklady Akademii Nauk SSSR,* v. 113, Apr. 11, 1957, p. 1066-1069.

14352* (Russian.) Complex Compounds of Lanthanum, Cerium, Praseodymium and Neodymium With Thiourea. **O kompleksnykh soedineniiakh lantana, tseriia, prazeodima i neodima s tiomochevinoi.** N. N. Sakharova. *Doklady Akademii Nauk SSSR,* v. 113, Apr. 11, 1957, p. 1073-1075.

Experimental preparation of compounds.

14353* (Russian.) Study of the Mechanism of Alkylation of Amines by N-Trimethyl-α-Phenylethylammonium Iodide. **Issledovanie mekhanizma alkilirovaniia aminov iodistym N-trimetil-α-fenetilammoniem.** D. N. Kursanov and S. V. Vitt. *Doklady Akademii Nauk SSSR,* v. 113, Apr. 21, 1957, p. 1283-1285.

14354* (Russian.) 2,4-Dimethyl-1,3-Pentadiene in the Synthesis of Alkanes With Two Quaternary Carbon Atoms Separated by a CH_2-Group (Ditertiary Alkylmethanes). **2,4-Dimetilpentadien-1,3 v sinteze alkanov s dvumia chetvertichnymi atomami ugleroda, razdelennymi CH_2-gruppoi (ditretichnoalkilmetanov).** R. Ia. Levina, Iu. S. Shabarov, V. K. Daukshas, and E. G. Treshchova. *Doklady Akademii Nauk SSSR,* v. 113, Apr. 21, 1957, p. 1286-1289.

Synthesis of paraffin hydrocarbons using 2,4-dimethyl-1,3-pentadiene as an initial product.

14355* (Russian.) Study of the Structure of Hydroxamic Acids and Some of Their Derivatives by Means of Infrared Spectroscopy. **Issledovanie stroeniia gidroksamovykh kislot i nekotorykh ikh proizvodnykh metodom infrakrasnoi spektrografii.** E. M. Usova and E. M. Voroshin. *Doklady Akademii Nauk SSSR*, v. 113, Apr. 21, 1957, p. 1306-1309.

Experimental data.

14356* (Russian.) Synthesis of Organotin Compounds by Way of Double Iodonium Salts. **Sintez Olovoorganicheskikh soedinenii cherez dvoinye iodonievye soli.** O. A. Ptitsyna, O. A. Reutov, and M. F. Turchinskii. *Doklady Akademii Nauk SSSR*, v. 114, May 1, 1957, p. 110-112.

14357 Glucosone. I. Preparation and Properties. Marie T. Hudson and Gladys E. Woodward. *Franklin Institute, Journal*, v. 264, July 1957, p. 61-68.

Preparation and purification by charcoal chromatography. Compound melted with decomposition between 85 and 96 C, and mutarotated from an observed specific rotation of −23.75 to 0.00°.

14358 Decomposition of Alcohols Over a Fischer-Tropsch Iron Catalyst. S. R. Srinivasan and N. G. Basak. *Fuel*, v. 36, July 1957, p. 277-285.

The decomposition was studied at normal pressure over an Fe:Cu:MgO:K_2O catalyst and at high vapor space velocities. Alcohol-like complexes may be formed as intermediates in a Fischer-Tropsch reaction.

14359 (German.) Tests in the Benzotropylium Series. **Untersuchungen in der Benztropylium-Reihe. VI.** The Polarographic Reduction of 2,3-Benzotropone, 4,5-Benzotropone and 2,7-Polymethylene-4,5-Benzotropone. **Die polarographische Reduktion des 2,3-Benztropons, des 4,5-Benztropons und der 2,7-Polymethylen-4,5-Benztropone.** R. W. Schmid and E. Heilbronner. **VII.** 2,3-Benzotropone and Benzotropylium-Cation. **2,3-Benztropon und Benztropylium-Kation.** H. H. Rennhard, G. Di Modica, W. Simon, E. Heilbronner, and A. Eschenmoser. *Helvetica Chimica Acta*, v. 40, no. 4, 1957, p. 950-968.

The preparation and some of the physico-chemical properties of the benzotropylium cation and of 2,3-benzotropone are described.

14360* (Russian.) Synthesis of 2-Cyclobutylbutane and 3-Cyclobutylpentane. **Sintez 2-tsiklobutilbutana i 3-tsiklobutilpentana.** B. A. Kazanskii, M. Iu. Lukina, and L. A. Nakhapetian. *Izvestiia Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk*, no. 6, June 1957, p. 692-696.

Methylethyl- and diethylcyclobutyl-carbinols are heated with a few drops of concentrated H_2SO_4, maintaining the four-member ring.

14361* (Russian.) Heterochain Polyesters. **O geterotsepnykh poliefirakh. I.** Polyesters of Isomeric Phthalic Acids. **O poliefirakh izomernykh ftalevykh kislot. II.** Polyesters of Diphenyldicarboxylic Acid Isomers. **Poliefiry izomernykh difenildikarbonovykh kislot.** V. V. Korshak, S. V. Vinogradova, and V. M. Beliakov. **III.** β-Methyladipic, and β-(*p*-Nitrophenyl) Glutaric Acid Polyesters. **O poliefirakh β-metiladipinovoi i β-(*p*-nitrofenil) glutarovoi kislot.** V. B. Korshak and S. V. Vinogradova. *Izvestiia Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk*, no. 6, June 1957, p. 730-749.

14362 Isomer Distribution in the Aluminum Chloride-Catalyzed Benzoylation of Toluene in Nitrobenzene. Herbert C. Brown and Herbert L. Young. *Journal of Organic Chemistry*, v. 22, July 1957, p. 719-723.

14363 Formation of Naphthalenes From Indenes. III. Substituted Methanes as Carbene Precursors. William E. Parham and Robert R. Twelves. *Journal of Organic Chemistry*, v. 22, July 1957, p. 730-734.

Data obtained from reactions with dichlorofluoromethane furnish direct evidence for the existence of chlorofluorocarbene, and indirect evidence to support the conclusion that the cyclopropane derived from this carbene and indene is more stable than other analogs studied.

14364 Coplanarity and Chromatographic Adsorbability of Some Isomeric Naphthylcycloalkenes and Polycyclic Aromatic Hydrocarbons. L. H. Klemm, David Reed, and C. D. Lind. *Journal of Organic Chemistry*, v. 22, July 1957, p. 739-743.

Semiquantitative studies on the relative adsorbabilities of various binary mixtures on alumina, silicic acid impregnated with picric acid or 2,4,7-trinitrofluorenone, and silicic acid alone.

14365 Physical Properties of Aminoazobenzene Dyes. VI. Intramolecular Hydrogen Bonding and Tautomerism in 4-Hydroxyazobenzene Derivatives and Higher Homologs. Eugene Sawicki. *Journal of Organic Chemistry*, v. 22, July 1957, p. 743-745.

14366 Reactions of Hydrogen Peroxide. I. A Novel Use of Selenium Dioxide as Catalyst for Oxidation of Acrolein to Acrylic Acid. Curtis W. Smith and Roy T. Holm. *Journal of Organic Chemistry*, v. 22, July 1957, p. 746-748.

Systems with low water content gave highest yield of monomeric acids.

14367 Studies in Organosilicon Chemistry. XXXIV. The Reaction of Trimethylsilylmethyl Metallic Compounds With Trichlorosilane. Bobby F. Dannels and Howard W. Post. *Journal of Organic Chemistry*, v. 22, July 1957, p. 748-750.

Includes infrared absorption curves for tris(trimethylsilylmethyl)silane, tris(trimethylsilylmethyl)silanol, and poly(trimethylsilylmethyl)siloxanes.

14368 Stable Organic Biradicals. Gilbert J. Sloan and Wyman R. Vaughan. *Journal of Organic Chemistry*, v. 22, July 1957, p. 750-761.

Preparations of 17 glycols, two of the corresponding glycol ethers, and 11 of the corresponding chlorides. The procedures are superior to previously reported methods and are of general applicability to all compounds of this type.

14369 Alkylation of α-Enol-γ-Butyrolactones Derived From Condensations of Ketones With Diethyl Oxalacetate. Gardner W. Stacy, James Wm. Cleary, and Melvin J. Gortatowski. *Journal of Organic Chemistry*, v. 22, July 1957, p. 765-769.

p-Nitrobenzyl chloride and 1-chloromethylnaphthalene are employed as alkylating agents with the Na salts of the α-enol-γ-lactones dissolved in dimethylformamide. The structure of the resulting alkylation products is that of an enol ether, as based on evidence relating to alkaline and acidic decomposition reactions and infrared absorption spectra.

14370 Hydrogenolysis of Acylhydroquinones. J. L. R. Williams. *Journal of Organic Chemistry*, v. 22, July 1957, p. 772-774.

Four acylhydroquinones were hydrogenated to the corresponding dialkylhydroquinones at 140-150 C and 3000-4000 p.s.i. In the case of 2,5-dihydroxycaprylophenone, the hydrogenation either was stopped at the intermediate carbinol stage or was carried to completion, yielding *n*-octylhydroquinone, by use of suitable operating conditions.

14371 Conversion of 4-Bromo-2-Heptene to Conjugated Diene. Fred L. Greenwood and John A. Sedlak. *Journal of Organic Chemistry*, v. 22, July 1957, p. 776-779.

4-Bromo-2-heptene was converted to a mixture of 1,3- and 2,4-heptadiene by dehydrobromination with *s*-collidine and by the Hofmann exhaustive methylation procedure. The mixtures obtained by the two procedures differed both in the ratio of structural isomers and in the distribution of geometrical isomers.

14372 Preparation and Properties of Ethyl Tetronate. J. Franklin Gillespie and Charles C. Price. *Journal of Organic Chemistry*, v. 22, July 1957, p. 780-783.

A three-step synthesis of ethyl tetronate from propargyl alcohol. Structure was proved by conversion to α-bromotetronic acid.

14373 Reaction of Ammonia With Some Acetylated and Benzoylated Monosaccharides. IV. Derivatives of L-Rhamnose. Jorge O. Deferrari and Venancio Deulofeu. *Journal of Organic Chemistry*, v. 22, July 1957, p. 802-805.

Tetrabenzoyl-L-rhamnose, on treatment with ammonia in methanol gave two products, *N,N'*-dibenzoyl-L-rhamnosylidenediamine and *N*-benzoyl-L-rhamnopyranosylamine.

14374 On the Color of Diaminopyromellitic Esters and Related Compounds. Lee Irvin Smith and Roger L. Abler. *Journal of Organic Chemistry*, v. 22, July 1957, p. 811-816.

The color of these substances is discussed in terms of resonance among the functional groups present. The principal frequencies in the ultraviolet, visible, and infrared spectra are given in tabular form.

14375 The Color Produced in Acetone Solutions of Nitroaromatics and Sodium Iodide. Richard W. Shellmann. *Journal of Organic Chemistry*, v. 22, July 1957, p. 818-820.

The color is associated with the I ion and not the cation. Intensity of color increases with increasing numbers of nitro groups in the aromatic ring.

14376 Amines. III. Characterization of Some Aliphatic Tertiary Amines. Leonard Spialter and Joseph A. Pappalardo. *Journal of Organic Chemistry*, v. 22, July 1957, p. 840-843.

Preparation and physical constants, including freezing points, refractive indices, densities, molar refractivities, and Eykman constants are summarized.

14377* Synthetic Experiments in the Benzopyrone Series. LXIV. Synthesis of Certain Diallyl Derivatives of 2-Methyl-5:7 Dihydroxy Isoflavone. P. S. Sarin, J. M. Sehgal, and T. R. Seshadri. *Journal of Scientific & Industrial Research*, v. 16, sec. B, May 1957, p. 206-209.

Synthesis of compounds with two α-methyl dihydrofuran rings and with one such ring along with an allyl substituent in the six position.

14378* (Russian.) Alkylation of Naphthalene With Alcohols in the Presence of BF_3 and Under Pressure. **Alkilirovanie naftalina spirtami v prisutstvii BF_3 pod davleniem.** I. A. Romadan, Iu. E. Pelcher, and O. A. Vitol. *Latvijas PSR Zinātnu Akademijas, Vestis*, no. 4, 1957, p. 143-145.

Alkylation of naphthalene with isobutyl and isoamyl alcohols in autoclave under 15-20 atm. of pressure at 165-170 C.

14379 The 1,2,3- and 1,2,4-Triazines, Tetrazines and Pentazines. John G. Erickson, Paul F. Wiley, and V. P. Wystrach. 261 p. 1956. Interscience Publishers, New York. (QD331 C42)

Covers, with the exception of 1,3,5-triazines, the chemistry of all six-membered N heterocycles containing more than two N atoms in the ring. Includes all condensed systems containing the rings.

14380 Organic Reactions. Roger Adams, editor. v. IX. 468 p. 1957. John Wiley & Sons, New York. (QD251 Or14r Vis.)

Cleavage of non-enolizable ketones with sodium amide; the Gattermann synthesis of aldehydes; the Baeyer-Villiger oxidation of aldehydes and ketones; alkylation of esters and nitriles; reaction of halogens with silver salts of carboxylic acids; synthesis of β-lactams; the Pschorr synthesis and related diazonium ring closure reactions.

14381* (Czech.) Increase in the Melting Point of Natural Wax on Adding Oxides, Hydroxides, or Carbonates. **Zvyšování bodu tání surového montánního vosku přídavkem kysličníků, hydroxydů nebo uhličitanů.** V. Včelák and J. Bartoška. *Paliva*, v. 37, June 1957, p. 194-196.

14382* *Review of Coal Tar Technology*, v. 8, July-Dec. 1956, 168 p.

Miscellaneous recent information on coal tar, primary fractions, tar acids and bases, monocyclic and polycyclic aromatic hydrocarbons, and utilization of coal tar and its products; also general chemistry and chemical techniques.

14383* (Italian.) Relationship Between Polarographic Constants and Structure of Organic Molecules. **Relazioni tra costanti polarografiche e struttura delle molecole organiche. IV.** Reduction Potentials of Furane-Derived Aldehydes and Correlation Between Various Series of Carbonyl Compounds. **Potenziali di riduzione di aldeidi derivate dal furano e correlazione tra varie serie di composti carbonilici.** Giovanni Giacometti. *Ricerca Scientifica*, v. 27, Apr. 1957, p. 1146-1154.

14384* (English.) **Syntheses of 2,2' - Diamino - Biphenyl and Carbazole From Phenanthrene.** Niichiro Tokura and Shigeru Anazawa. *Science Reports of the Research Institutes, Tôhoku University*, ser. A, v. 9, June 1957, p. 239-244.

Diphenic acid, obtained by the oxidation of phenanthrene, was converted to 2,2'-diaminobiphenyl through diphenic acid diamide.

14385 New Tool for Testing Automobile Waxes and Polishes. John D. Saunier and Leon Kresser. *Soap and Chemical Specialties*, v. 33, July 1957, p. 73 + 5 pages.

Radioactive tracers provide answers to the question of the relation of thickness of wax film to durability of different formulations.

14386* Some Considerations Concerning the Stability of Liquid Detergents at Low Temperatures. R. W. Noad. *Soap, Perfumery & Cosmetics*, v. 30, July 1957, p. 705 + 4 pages.

The physical stability of liquid anionic detergents is discussed in terms of the minimum temperature at which the product is stable indefinitely.

14387* Blending and Fixation in Perfumery. Jack Pickthall. *Soap, Perfumery & Cosmetics*, v. 30, July 1957, p. 712-718.

Blending, in addition to changing the ambient character of the ingredients of a mixture, may increase rates of evaporation. Fixation is to slow down the rate of evaporation of the more volatile members.

14388* (English.) **The Intensities of the Carbonyl Group Vibration in Some Aromatic Compounds.** H. W. Thompson, R. W. Needham, and D. Jameson. *Spectrochimica Acta*, v. 9, no. 3, 1957, p. 208-215.

Data on ethyl benzoates, benzaldehydes, acetophenones, benzophenones, and propiophenones.

14389 Synthetic Methods of Organic Chemistry. W. Theilheimer. v. XI. 494 p. 1957. Interscience Publishers, New York. (QD262 T34str Vis.)

A review of the literature on synthesis of organic compounds.

14390* The Systematic Identification of Organic Compounds. Ralph L. Shriner, Reynold C. Fuson, and David Y. Curtin. 4th Ed. 426 p. 1956. John Wiley & Sons, New York. (QD261 Sh86s4 Ref.)

A laboratory manual.

14391 The Terpenes. v. IV. The Triterpenes and Their Derivatives: Hydrocarbons, Alcohols, Hydroxy-Aldehydes, Ketones and Hydroxy-Ketones. John Simonsen and W. C. J. Ross. 524 p. 1957. Cambridge University Press, London. (QD416 Si56t2)

14392 A Study of the Isomerization of C^{14}-Labeled Perinaphthene. Masao Nakazaki. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3700, Mar. 1957, 15 p. (UF767 U3u Contin.)

Perinaphthene labeled at the number eight position with C^{14} was synthesized. Upon a variety of oxidative degradations it behaves as though it were in a rapid tautomerism, so that positions two and five are equivalent to position eight.

14393* (Russian.) Study of Alkylation Conditions of Toluene With Ethylene. **Izuchenie uslovii alkilirovaniia toluola etilenom.** A. V. Bondarenko, M. I. Bogdanov, and M. I. Farberov. *Zhurnal Prikladnoi Khimii*, v. 30, May 1957, p. 781-786.

Alkylation in the presence of $AlCl_3$ occurs with a ethylene/toluene ratio of 0.5-0.6/1 mole. Speed of reaction is in proportion to the square root of the catalyst concentration; temperature coefficient in the range of 75 to 85 C is 1.45. The ethyltoluene thus obtained consists of about 70% *m*-isomer and about 30% of *p*-isomer.

See also: **14245** (standard acid intercomparisons); **14290** (Cu N,N,N',N'-tetrakis-(hydroxpropyl)-ethylenediamine complexes); **14630** (reduction of nitrobenzene); **15448** (study of oils for extending rubber).

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14394* (English.) **Activation in the Solvolytic Substitution Reactions of Unstable Alkoxymethyl Cations.** Pentti Salomaa. *Acta Chemica Scandinavica*, v. 11, no. 3, 1957, p. 468-472.

Measurements were made of the reaction-product composition in the unimolecular solvolysis of methoxymethyl chloride and ethoxymethyl chloride in water-ethanol mixtures at temperatures varying between 0 and 75 C.

14395* (German.) On the Light Absorption of Condensed Aromatic Compounds. **Zur Lichtabsorption der kondensierten aromatischen Verbindungen. II.** Light Absorption of Linearly Condensed Aromatic Compounds. **Die Lichtabsorption der linear kondensierten aromatischen Verbindungen. III.** Light Absorption of Angularly Condensed Aromatic Compounds. **Die Lichtabsorption der angular kondensierten aromatischen Verbindungen.** Á. Kiss. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 11, nos. 1-2, 1957, p. 85-111.

14396 (English.) **The Crystal Structure of Diphenyl Sulfoxide.** S. C. Abrahams. *Acta Crystallographica*, v. 10, pt. 6, June 1957, p. 417-422.

14397 (English.) **The Crystal Structure of Sodium Pyrophosphate Decahydrate, $Na_4P_2O_7 \cdot 10H_2O$.** D. M. MacArthur and C. A. Beevers. *Acta Crystallographica*, v. 10, pt. 6, June 1957, p. 428-432.

14398* (French.) Superfluid Helium. **L'hélium superfluide.** Jacques Winter. *Âge Nucléaire*, no. 4, May-June 1957, p. 55-57.

At 2.18 K He undergoes a radical change in physical properties, the most remarkable being an extremely rapid reduction in viscosity. Other phenomena such as the equalizing of levels in two non-communicating flasks when brought sufficiently close to each other, and movement of the liquid under the influence of local temperature rises.

14399 Ionic Association. I. Derivation of Constants From Conductance Data. Raymond M. Fuoss. **II. Several Salts in Dioxane-Water Mixtures.** Raymond M. Fuoss and Charles A. Kraus. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3301-3310.

Data for quaternary ammonium salts show the presence of a previously unsuspected linear term in conductance, which is due to the viscosity increase produced by bulky ions. Consequently solution viscosity rather than solvent viscosity should be used in treating conductance.

14400 Microwave Absorption and Molecular Structure in Liquids. XIX. The Effect of Internal Field Upon Molecular Relaxation Times in Liquids. Robert C. Miller and Charles P. Smyth. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3310-3313.

14401 Infrared Absorption Spectra of Inorganic Coordination Complexes. XII. The Characteristic NH_3 Deformation Vibrations of Solid Inorganic Complexes. G. F. Svatos, D. M. Sweeny, San-ichiro Mizushima, Columba Curran, and J. V. Quagliano. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3313-3315.

The NH_3 degenerate deformation is observed in the region of 1650-1560 $cm.^{-1}$; NH_3 symmetric deformation in the region of 1350-1150 $cm.^{-1}$; NH_3 rocking frequency in the region of 950-650 $cm.^{-1}$.

14402 Infrared Absorption of Metal Chelate Compounds of 1,3-Diketones. Henry F. Holtzclaw, Jr. and James P. Collman. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3318-3322.

Spectra and preparation of 13 1,3-diketones, the Cu chelates of 17 1,3-diketones, and the acetylacetone chelates of four metals.

14403 Addition of Methyl Radicals to Acetylenic Compounds. M. Gazith and M. Szwarc. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3339-3343.

The energies and entropies of activation are higher than those in reactions involving ethylenic compounds.

14404 Photochemical Exchange of Water Between Cr $(H_2O)6^{+++}$ and Solvent. Robert A. Plane and John P. Hung. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3343-3346.

14405 The Mechanism of Chemisorption: Ethylene and Ethane on Nickel. P. W. Selwood. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3346-3351.

Magnetization-volume isotherms were obtained for ethylene and for ethane on a commercial Ni-kieselguhr catalyst, for ethylene on a coprecipitated Ni-silica catalyst, for H on a Ni surface already covered in part with chemisorbed ethylene, and for ethane on a surface already covered with H.

14406 Equilibrium in the System GeO_2-H_2-Ge-H_2O. Toshio Yokokawa, Masumichi Koizumi, Mitsuo Shimoji, and Kichizo Niwa. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3365-3367.

The equation for the free energy of formation of GeO_2 is $-131{,}700 + 41.4T$. The standard heat of formation is -132.3 kcal./mole.

14407 Halogen Atom Reactions Initiated by Nuclear Processes in Hydrocarbon Solutions. Sukumar Aditya and John E. Willard. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3367-3371.

14408 Antiferromagnetic Ordering and Electronic Structure of $CuCl_2 \cdot 2H_2O$ as Determined From Nuclear Magnetic Resonance. R. E. Rundle. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3372-3374.

The odd-electron must be about 25% on each Cl and 50% on Cu.

14409 Kinetic Studies on the Thermal Decomposition of *t*-Butyl Hydroperoxide in Dodecane Solution. B. Kathleen Morse. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3375-3380.

14410 Kinetics and Mechanism of the Formation of Azoxy Compounds. Yoshiro Ogata, Masaru Tsuchida, and Yasuo Takagi. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3397-3401.

The condensation of phenylhydroxylamine and nitrosobenzene to yield azoxybenzene was studied kinetically at 50, 40, 30, and 20 C in pure and aqueous methanolic solutions using the ultraviolet spectrophotometer. The rate is proportional to the concentration of both reactants. The rate constant varies with addition of acid (0.0001-0.1 *N*).

14411 The Kinetics of Solvolysis of Acyl Esters of Salicyclic Acid. Edward R. Garrett. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3401-3408.

The acid, neutral and alkaline hydrolysis of acetyl-, trimethylacetyl-, β-cyclopentylpropionyl-, and diethylacetylsalicyclic acids were studied and the rate constants determined as functions of dissociation and of H and hydroxyl ion concentration.

14412 Endocyclic α,β-Unsaturated Ketones. VI. Ultraviolet and Infrared Absorption Spectra and Resonance Stabilizations. Richard D. Campbell and Norman H. Cromwell. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3456-3463.

14413 Stereochemistry of Allylic Rearrangements. IX. The Solvolysis of Trans-α,γ-Dimethylallyl Acid Phthalate in Aqueous Acetone. Harlan L. Goering and Richard W. Greiner. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3464-3466.

14414 The Effects of Deuterium Substitution on the Rates of Organic Reactions. V. Hydrolysis of α-Deutero Ketals. V. J. Shiner, Jr. and Sally Cross. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3599-3602.

The magnitude of the effect is solvent dependent and varies according to the nature of the substituents on the α-carbon atom.

14415 Palladium Hydride. I. The Thermodynamic Properties of Pd_2H Between 273 and 345°K. II. The Entropy of Pd_2H at O°K. III. Thermodynamic Study of Pd_2D From 15 to 303°K. Evidence for the Tetrahedral PdH_4 Structure in Palladium Hydride. Donald M. Nace and J. G. Aston. *American Chemical Society, Journal*, v. 79, July 20, 1957, p. 3619-3633.

14416 Low Temperature Heat Capacities of Magnesium Diboride (MgB_2) and Magnesium Tetraboride (MgB_4). Robinson M. Swift and David White. *American Chemical Society, Journal*, v. 79, July 20, 1957, p. 3641-3644.

14417 The Ionization of Sulfuric Acid. Milton Kerker. *American Chemical Society, Journal*, v. 79, July 20, 1957, p. 3664-3667.

The method of Sherrill and Noyes, based on conductance and transference number, was used to calculate the ionization at 18 and 50 C from data in the literature and to extend the results at 25 C to higher concentrations.

14418 Kinetics of the Homogeneous Reaction of NO and H_2. Wendell M. Graven. *American Chemical Society, Journal*, v. 79, July 20, 1957, p. 3697-3700.

14419 The Chemical Consequences of the $N^{14}(n,p)C^{14}$ Reaction in the Acetamide System and the Implications of Nuclear Recoil as a Tool for Synthesis. Alfred P. Wolf, Carol S. Redvanly, and R. Christian Anderson. *American Chemical Society, Journal*, v. 79, July 20, 1957, p. 3717-3724.

Acetic acid-1,2-C_1^{14} were prepared from acetamide irradiated in a nuclear reactor.

14420* The Ionization Constants of *p*-Aminobenzoic Acid in Aqueous Solution at 25°C. R. A. Robinson and A. I. Biggs. *Australian Journal of Chemistry*, v. 10, May 1957, p. 128-134.

14421* Kinetics of the Reaction Between Manganese Dioxide and Ferrous Ion. D. F. A. Koch. *Australian Journal of Chemistry*, v. 10, May 1957, p. 150-159.

14422 Vapor Pressure and Equilibrium Studies of the Sodium Fluoride-Beryllium Fluoride System. Karl A. Sense, Richard W. Stone, and R. B. Filbert, Jr. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-1186, May 1957, 30 p. (UF767 U3b Contin.)

Study of the vapor pressure of BeF_2 over the temperature interval 802 to 1025 C showed good agreement with previous data taken over the 802-968 C range. A liquid-vapor phase diagram and plots showing how the total pressure varies with composition are presented.

14423* (French.) Polarographic Study of Allyl Halides. **Études polarographiques sur les halogénures allyliques. I.** Allyl Bromide and Allyl Mercuric Compounds. **Le bromure d'allyle et les composés allyle-mercuriques.** Albert Kirrmann and Micheline Kleine-Peter. **II.** Substituted Allyl Bromides. **Les bromures d'allyle substitués.** Micheline Kleine-Peter. *Bulletin de la Société Chimique de France*, no. 7, July 1957, p. 894-904.

Beside the usual reduction wave of bromides, a preliminary kinetic wave was observed; the accessory formation of an organo-mercuric compound is confirmed and the cathodic reduction explained. Six allyl bromides, substituted by halides or CH_3 groups were studied.

14424 Counter Diffusion of Ions in Water. E. R. Gilliland, R. F. Baddour, and D. J. Goldstein. *Canadian Journal of Chemical Engineering*, v. 35, June 1957, p. 10-17.

General equations for the simultaneous diffusion of many ions are set up and integrated for the case of diffusion in diaphragm cells.

14425* The Quaternary System: Benzene-Carbon Tetrachloride-Acetic Acid-Water at 25°C. R. G. H. Prince and T. G. Hunter. *Chemical Engineering Science*, v. 6, no. 6, 1957, p. 245-261.

Apparatus is described for the accurate determination of liquid-liquid equilibrium in ternary and quaternary systems by the synthetic method. Relationships between the equilibrium concentrations in these systems are discussed.

14426* (English.) **Dipole Moments and Internal Rotation of Some Halogenated Hydrocarbons in the Vapor State.** Ichiro Miyagawa, Takehiko Chiba, Shoichi Ikeda, and Yonezo Morino. *Chemical Society of Japan, Bulletin*, v. 30, Apr. 1957, p. 218-222.

Data on six compounds.

14427* (English.) **The Adsorption of Non-Polar Gases on Alkali Halide Crystals. II. Calculations of the Adsorption Behaviour of Non-Polar Gases on Cubic Sodium Chloride. III. The Low-Temperature Adsorption of Non-Polar Gases on Cubic Potassium Chloride.** Teruo Hayakawa. *Chemical Society of Japan, Bulletin*, v. 30, Apr. 1957, p. 236-248.

14428* (German.) The Solubility Product of Thallic Oxide. **Das Löslichkeitsprodukt des Thallium(III)-oxydes.** P. Schindler. *Chimia (Switzerland)*, v. 11, June 1957, p. 164-166.

Two series of measurements show that equilibrium constant is independent of pH and metallic ion concentration over a considerable range.

14429* (Italian.) Liquid-Vapor Equilibrium. Ethyl Chloride-Butane Mixtures. **Equilibrio liquido-vapore. Miscele cloruro d'etile-butano.** Giancarlo Perugini. *Chimica e l'Industria*, v. 39, June 1957, p. 445-448.

At 738.6 atm., an azeotropic mixture was developed (b.p. 1.4 C) composed of 18.6 mole % ethyl chloride and 81.4 mole % butane.

14430* (French.) A Study of the Paramagnetic Nuclear Resonance of Protons in Solid Cyclohexanol as a Function of Temperature. **Étude de la résonance paramagnétique nucléaire des protons dans le cyclohexanol solide en fonction de la température.** Pierre Averbuch. *Comptes Rendus*, v. 244, June 24, 1957, p. 3147-3150.

Molecules began to rotate: two by two around a common axis, below −96 C; around their center of gravity, in any orientation, at −70 C. At "high temperatures" molecules diffused through the crystal.

14431* (French.) Formation Constants of the Complexes of Certain Acids Aminated With Nickel. Interpretation of the Chelation Effect. **Constantes de formation des complexes de certains acides aminés avec le nickel. Interprétation de l'effet de chelation.** Simonne Pelletier. *Comptes Rendus*, v. 245, July 8, 1957, p. 160-162.

Formation constants were determined at 10, 30 and 40 C by using potash to titrate various mixtures of methionine-Ni^{++}, serine-Ni^{++}, and valine-Ni^{++}. Variations of enthalpy, free energy, and entropy were calculated.

14432* (Russian.) Effect of the Medium on the Amount of Hydrogen Adsorbed on Skeletal Nickel and Platinum Catalysts. **Zavisimost kolichestva adsorbirovannogo na nikel'-skeletnom i platinovom katalizatorakh vodoroda t sredy.** D. V. Sokol'skii and K. K. Dzhardamalieva. *Doklady Akademii Nauk SSSR*, v. 113, Apr. 1957, p. 860-862.

Effect of alkali solutions and acids of a different concentration on H adsorbtion.

14433* (Russian.) Influence of the Chemical Bond on the Fine Structure of the X-Ray Emission Lines of the Kβ Group of Titanium in Certain Compounds. **Vliianie khimicheskoi sviazi na tonkuiu strukturu linii Kβ-gruppy rentgenovskogo emissionnogo spektra titana v nekotorykh soedineniiakh.** E. E. Vainshtein and Iu. N. Vasil'ev. *Doklady Akademii Nauk SSSR*, v. 114, May 1, 1957, p. 53-56.

A comparative study of the spectral lines of Ti in TiO_2, TiC, and $TiWC_2$.

14434* (Russian.) Relation Between the Electric Properties of Crystals and the Crystal Lattice Constants. **O sviazi elektricheskikh svoistv kristallov s parametrami kristallicheskoi reshetki.** V. A. Presnov and V. I. Gaman. *Doklady Akademii Nauk SSSR*, v. 114, May 1, 1957, p. 67-69.

The electrical properties of crystals vary with the nature and arrangement of particles in the lattice. Formulas are derived relating crystal and electrical parameters.

14435 Electron-Transfer Spectra of Ferrocene. J. C. D. Brand and W. Snedden. *Faraday Society, Transactions*, v. 53, July 1957, p. 894-900.

The electronic transition of ferrocene in CCl_4 at 307 mμ is attributed to intermolecular charge-transfer in which ferrocene serves as the electron donor.

14436 Fundamental Vibration Frequencies and Force Constants in the Azide Ion. Peter Gray and T. C. Waddington. *Faraday Society, Transactions*, v. 53, July 1957, p. 901-908.

14437 The Thermodynamic Properties of Aqueous Solutions of Polyethylene Glycol, Polypropylene Glycol and Dioxane. G. N. Malcolm and J. S. Rowlinson. *Faraday Society, Transactions*, v. 53, July 1957, p. 921-931.

14438 Correlation of the Mutual Solubilities of Two Liquids With the Electric and Magnetic Properties of the Pure Components. Eduardo A. Pasquinelli. *Faraday Society, Transactions*, v. 53, July 1957, p. 932-938.

14439 Metal-Carbon Bonds. I. The Pyrolyses of Dimethyl Mercury and Dimethyl Cadmium. S. J. W. Price and A. F. Trotman-Dickenson. *Faraday Society, Transactions*, v. 53, July 1957, p. 939-944.

Thermal decompositions were studied by the toluene-carrier technique between 465 and 608 C, and 469 and 571 C. The progress of the reactions was followed by measuring the hydrogen, methane, ethylene, and ethane formed.

14440 The Mechanism of the Inhibition of the Hydrogen + Oxygen Reaction by Ethane. R. R. Baldwin and R. F. Simmons. *Faraday Society, Transactions*, v. 53, July 1957, p. 964-971.

Minor diameter effects obtained in second limit studies are attributed to the destruction of radicals such as H and OH present in the uninhibited reaction, rather than to any diameter-dependent process in the inhibition.

14441 The Reaction of Sulphur With Hydrocarbons. W. J. Thomas and R. F. Strickland-Constable. *Faraday Society, Transactions*, v. 53, July 1957, p. 972-981.

Reactions show the unusual feature of a rate increasing throughout the course of the reaction until a rather abrupt stop is reached on completion. This is attributed to the formation of unsaturated hydrocarbons as intermediate compounds.

14442 The Effect of Pressure on Some Free-Radical Reactions of 1:2-Dichloroethylene. A. H. Ewald, S. D. Hamann, and J. E. Stutchbury. *Faraday Society, Transactions*, v. 53, July 1957, p. 991-996.

In the presence of benzoyl peroxide, 1,2-dichlorethylene undergoes both isomerization and polymerization. The polymerization is accelerated by an increase in pressure, whereas the isomerization is retarded.

14443* Partial Molar Volumes of Some Salts in Aqueous Solutions. E-an Zen. *Geochimica et Cosmochimica Acta*, v. 12, nos. 1-2, 1957, p. 103-122.

The partial molar volumes of most of the studied salts are less than their molar volumes in the solid state, and so their pressure coefficients of solubility are positive. Some possible applications are summarized and examples given.

14444 (French.) Spectroscopic Studies of Complexes Formed by *Lewis* Acids. **Étude spectroscopique des complexes formés par les acides de *Lewis*. IV.** Infrared Absorption Spectra of Addition Compounds of Aluminum Chloride With Acetyl and Mesitoyl Chlorides. **Spectre d'absorption infrarouge des composés d'addition du chlorure d'aluminium avec les chlorures d'acétyle et de mésitoyle.** Bernard P. Susz and Jean-Jacques Wuhrmann. *Helvetica Chimica Acta*, v. 40, no. 4, 1957, p. 971-980.

The preparation of addition compounds of acetyl and mesitoyl chlorides with Al_2Cl_6. The infrared spectra of these almost colorless solids were determined.

14445* Studies on the Dependence of Optical Activity on Chemical Constitution. XLVI. The Rotatory Dispersion of *d*-Camphor-β-Sulphonyl-Nitrophenylamides (*o*-, *m*- and *p*-), *d*-Camphor-β-Sulphonylphenylene Diamines (*o*-, *m*- and *p*-), and (*o*-, *m*- and *p*-) Phenylene *bis*-*d*-Camphor-β-Sulphonylamides. Bawa Kartar Singh and Shiva Mohan Verma. *Indian Academy of Sciences, Proceedings*, v. 45, sec. A, May 1957, p. 298-310.

14446* Raman Spectra of Alkali Halides. R. S. Krishnan and P. S. Narayanan. *Indian Institute of Science, Journal*, v. 39, sec. A, Apr. 1957, p. 85-92 + 1 plate.

Observations on KI, NaCl, KBr, and CsBr.

14447* Adiabatic Piezo-Optic Coefficients of Liquids (Ethyl Acetate, Methyl Acetate, Amyl Acetate and Cyclohexanol). C. K. Narayanaswamy. *Indian Institute of Science, Journal*, v. 39, sec. A, Apr. 1957, p. 113-124.

Data are discussed in the light of deviation from refraction formulas, temperature coefficient of refractive index at constant density, and relation between the adiabatic and the isothermal piezo-optic coefficients.

14448* Spectrophotometric Investigations on the Iron (III)-Morellin Complex. S. G. Tandon and C. C. Patel. *Indian Institute of Science, Journal*, v. 39, sec. A, Apr. 1957, p. 129-137.

The Iron (III)-morellin complex dissociates in absolute alcohol medium; the equilibrium constant determined spectrophotometrically averages $4{\cdot}95 \times 10^{-17}$ at 25 C. The free energy of formation of the complex is −22·15 kcal/mole.

14449* High Pressure Catalytic Ammonolysis of Alcohols. V. A. Krishnamurthy and M. R. A. Rao. *Indian Institute of Science, Journal*, v. 39, sec. A, Apr. 1957, p. 138-160.

14450* (Russian.) Oxidation-Reduction Systems Initiating Radical Processes. **Okislitel'no-vosstanovitel'nye sistemy dlia initsiirovaniia radikal'nykh protsessov. IV.** Oxidation-Reduction Systems Initiating Polymerization in Hydrocarbon Media. **Okislitel'no-vosstanovitel'nye sistemy dlia initsiirovaniia polimerizatsii v uglevodorodnykh sredakh.** E. I. Tiniakova, B. A. Dolgoplosk, and M. B. Rabinovich. *Izvestiia Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk*, no. 6, June 1957, p. 702-710.

Study of the oxidation-reduction mechanism of the system: benzoyl peroxide, benzoin, and iron naphthenate. Oxides of variable-valency metal naphthenates in a hydrocarbon medium accelerate the decomposition of isopropylbenzene hydroperoxide, creating favorable conditions for initiation of polymerization.

14451 The Estimation of Solvent Power by the Dilution Ratio Method. W. R. Moore and A. M. Brown. *Journal of Applied Chemistry*, v. 7, June 1957, p. 332-342.

Determinations of the volumes of different precipitates required just to cause precipitation of cellulose nitrate, cellulose acetate, and ethyl cellulose from dilute solutions in representative solvents are made and the values compared with those of the polymer-solvent interaction parameter μ.

14452 Desorption and Absorption of Gases by Drops During Impact. B. E. Dixon and G. C. Hands. *Journal of Applied Chemistry*, v. 7, June 1957, p. 342-348.

14453 Some Aspects of Organic Molecules and Their Behavior. II. Bond Energies. Otto Reinmuth. *Journal of Chemical Education*, v. 34, July 1957, p. 318-324.

14454 Small Angle X-Ray Scattering From Solutions of Alkali Metals in Liquid Ammonia. Paul W. Schmidt. *Journal of Chemical Physics*, v. 27, July 1957, p. 23-28.

Scattering from solutions of Li, Na, and K in liquid ammonia was measured using Mo K radiation. Scattering curves were obtained for a series of concentrations of Li solutions at −75 C, for one concentration at −45 C and 75 C for K, Na, and Li solutions of approximately the same molarity, and for Li and Na solutions near saturation.

14455 Thermodynamics of the V-O System: Dissociation Energies of VO and VO_2. Joseph Berkowtiz, W. A. Chupka, and Mark G. Inghram. *Journal of Chemical Physics*, v. 27, July 1957, p. 87-90.

14456 Microwave Spectrum, Structure, and Internal Barrier of Methyl Silane. R. W. Kilb and Louis Pierce. *Journal of Chemical Physics*, v. 27, July 1957, p. 108-112.

14457 Discrimination Between "Radiative" and Nonradiative" Transfer of Molecular Excitation Energy in Liquid Systems. A. Weinreb. *Journal of Chemical Physics*, v. 27, July 1957, p. 133-136.

A quenching agent is added, which quenches the transfer process and the competition between quenching and nonradiative transfer is utilized. Method is applied to the system diphenyl oxazole + diphenylhexatriene in toluene.

14458 Kinetic Study of the Oxidation of Uranium Dioxide. S. Aronson, R. B. Roof, Jr., and J. Belle. *Journal of Chemical Physics*, v. 27, July 1957, p. 137-144.

Oxidation of UO_2 to U_3O_8 in dry air and O at temperatures of 160 to 350 C proceeds by a two-step reaction. In the first step the tetragonal oxide of composition $UO_{2.34 \pm 0.03}$ is formed. In the second step this tetragonal phase is converted to orthorhombic U_3O_8.

14459 Tentative Phase Diagram for Solid H_2S. Richard Stevenson. *Journal of Chemical Physics*, v. 27, July 1957, p. 147-150.

14460 Vibrational Spectrum of Dimethylphosphine. Harold C. Beachell and Bernard Katlafsky. *Journal of Chemical Physics*, v. 27, July 1957, p. 182-185.

14461 Exploding Wire as a Light Source in Flash Photolysis. Gisela K. Oster and R. A. Marcus. *Journal of Chemical Physics*, v. 27, July 1957, p. 189-192.

Method consists of discharging a bank of condensers, via a mechanical switch through a thin nichrome wire. The wire explodes, emitting light rich in the ultraviolet region in less than a millisecond. Luminous efficiency in the 200 to 330 mμ region is of the order of 10% of the input.

14462 Crystal and Molecular Structure of B_9H_{15}. Richard E. Dickerson, Peter J. Wheatley, Peter A. Howell, and William N. Lipscomb. *Journal of Chemical Physics*, v. 27, July 1957, p. 200-209.

14463 Study on the State of Nitrogen Adsorbed on Evaporated Barium Film. Yozo Sasaki. *Journal of Chemical Physics*, v. 27, July 1957, p. 281-285.

14464 Kinetic Study of the Aluminum Chloride-Catalyzed Benzoylation of Benzene and Toluene in Nitrobenzene Solution. Partial Rate Factors for the Benzoylation Reaction. Herbert C. Brown and Herbert L. Young. *Journal of Organic Chemistry*, v. 22, July 1957, p. 724-730.

14465* Infrared Spectra of Sugar Acetates in Solution. Horace S. Isbell, Francis A. Smith, E. Carroll Creitz, Harriet L. Frush, Joseph D. Moyer, and James E. Stewart. *Journal of Research, National Bureau of Standards*, v. 59, July 1957, p. 41-78.

14466* Turbidity and Viscosity Measurements on Some Cationic Detergents in Water and in Sodium Chloride Solutions. Lawrence M. Kushner, Willard D. Hubbard, and Rebecca A. Parker. *Journal of Research, National Bureau of Standards*, v. 59, Aug. 1957, p. 113-119.

Light-scattering and viscosity measurements were made on dodecylamine hydrochloride and dodecyltrimethylammonium and tetradecytrimethylammonium chlorides.

14467* Dipole Moments of *m*-Dinitro-Benzene & *m*-Bromonitro-Benzene From the Liquid State. D. A. A. S. Narayana Rao and M. V. S. Samba Murty. *Journal of Scientific & Industrial Research*, v. 16, sec. B, May 1957, p. 183-185.

Dipole moments were calculated from data obtained for dielectric constants in the molten state.

14468* High Pressure Vapour-Liquid Equilibria of Non-Ideal Solutions. II. Benzene-Methyl Ethyl Ketone System. V. N. Kumarkrishna Rao, D. R. Swami, and M. Narasinga Rao. *Journal of Scientific & Industrial Research*, v. 16, sec. B, May 1957, p. 195-201.

Shifts of the azeotrope with pressure and temperature are correlated empirically. The system becomes non-azeotropic under pressures greater than 125 lb./sq. in.

14469* Studies on the Relation Between Chemical Constitution & Ultraviolet Absorption Spectra of Optically Active & Racemic Compounds. I. Correlation of Absorption Maxima & 'Characteristic' Wavelengths of Camphor-β-Sulphonyl-Phenylamides (*d*- & *dl*-), Their Bromo Derivatives & Methylamino-Camphor-β-Sulphonates (*d*- & *dl*-) & Their Ketimines (*d*- & *dl*-). Bawa Kartar Singh and M. K. P. Amma. *Journal of Scientific & Industrial Research*, v. 16, sec. B, May 1957, p. 202-206.

14470* (Russian.) Using Radioactive Carbon in Studying the Behavior of Methane During the Synthesis of Hydrocarbons From CO and H_2 on Iron Catalysts. **Ispol'zovanie radioaktivnogo ugleroda dlia issledovaniia povedeniia metana v usloviiakh sinteza uglevodorodov iz CO i H_2 na zheleznykh katalizatorakh.** *Khimiia i Tekhnologiia Topliva, i Masel*, no. 6, June 1957, p. 26-33.

Critical survey of literature on methane's part in the synthesis of hydrocarbons from CO and H_2. A balanced high productive process using a fused iron catalyst under 20-25 atm. with methane marked by radioactive C.

14471 The Kinetics of Molten Metal-Water Reactions: A Report on Na_2K-Water Vapor. H. M. Saltsburg. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission)*, KAPL-1763, Apr. 1957, 36 p. (UF767 Un3.1ka Contin.)

A method is suggested for studying the kinetics of the reaction of molten metals with vapors so that the reactive metal surface is relatively free from films of reaction product and the vapor flow is definable, not only in terms of pressure and composition, but also in a hydrodynamic sense.

14472* (Hungarian.) Investigation of the Grain Size of Pneumatically Decomposed Alumina Hydrate. **Timföldhidrát szemesenagyságának vizsgálata levegővel való kikeverés esetén.** Sándor Dunay and Miklós Kalmár. *Kohászati Lapok*, v. 12, Jan.-Feb. 1957, p. 46-53.

Industrial and laboratory investigation on the changes produced in the grain size of alumina hydrate decomposed in air.

14473* (Russian.) Composition and Dissociation Constants of Nickel, Cobalt, Iron, and Manganese Complexes With Trithiocarbonic Acid Salts. **Sostav i konstanty dissotsiatsii kompleksov nikelia, kobal'ta, zheleza i margantsa s soliami tritiougol'noi kisloty.** Iu. A. Bankovskii and A. F. Ievin'sh. *Latvijas PSR Zinātnu Akademijas, Vestis*, no. 3, 1957, p. 123-131.

14474 pH Measurements: Their Theory and Practice. Victor Gold. 125 p. 1956. John Wiley & Sons, New York. (QD561 G56p)

Basic theory of pH and electrometric and optical techniques for its measurement.

14475* (German.) Experiments on the Variation of the Adsorption Characteristics of Commercial Silica Gel Through Thermal and Chemical Surface Changes. **Versuche zur Varriierung der Adsorptionseigenschaften von handelsüblichem Silikagel durch thermische und chemische Veränderungen dessen Oberfläche.** K. H. Ebert. *Monatshefte für Chemie*, v. 88, June 1957, p. 275-287.

Effect of substitution of surface Si-OH groups with organic components and of various temperatures on adsorption of ethyls and water.

14476* (German.) Polarographic Studies in Water-Free Morpholine. **Polarographische Untersuchungen in wasserfreiem Morpholin.** V. Gutmann and E. Nedbalek. *Monatshefte für Chemie*, v. 88, June 1957, p. 320-324.

Polarographic behavior of various metal chlorides, bromides, iodides, sulfates, and nitrates in water-free morpholine.

14477* Equilibrium Sedimentation of Macromolecules in Density Gradients. Matthew Meselson, Franklin W. Stahl, and Jerome Vinograd. *National Academy of Sciences of the United States of America, Proceedings*, v. 43, July 1957, p. 581-588.

A new method for study of the mol. wt. and partial specific volume of macromolecules, with some illustrations based on results with deoxyribonucleic acid and several viruses.

14478 A Kinetic Study of the Reaction, $UO_2 + 4HF \rightarrow UF_4 + 2H_2O$. I. Development of the Rate Equation. Richard E. DeMarco, DuWane C. Bonfer, and Robert C. Abbott. *National Lead Company of Ohio, Technical Division (U. S. Atomic Energy Commission)*, NLCO-675, Apr. 1957, 27 p. (UF767 Un3.1nL Contin.)

A rate equation is proposed which is dependent on the UO_2 concentration and the rate of diffusion of HF through the UF_4 formed to the UO_2 interface. An activation energy of 8 kcal. mole was calculated for the hydrofluorination reaction.

14479 The Thermal and Magnetic Properties of Ytterbium Ethyl Sulphate Between 20°K and 1°K. A. H. Cooke, F. R. McKim, H. Meyer, and W. P. Wolf. *Philosophical Magazine*, v. 2, ser. 8, July 1957, p. 928-935.

14480 (English.) **On the Molecular Constitution of Liquid and Amorphous Sulfur.** J. Schenk. *Physica*, v. 23, June 1957, p. 546-550.

14481 Intensities in Inorganic Complexes. Andrew D. Liehr and C. J. Ballhausen. *Physical Review*, v. 106, ser. 2, June 15, 1957, p. 1161-1163.

A method for calculating the intensity of d^n electronic transitions in inorganic complexes is developed and subsequently applied to the computation of the intensity of the visible absorption bands of Ti(III) and Cu(II) complexes.

14482* (English.) **Effect of the Basic Strength of Attached Groups on Light Absorption Spectra. I. Light Absorption of Triphenylmethane Dyes.** Reikiti Itoh. *Physical Society of Japan, Journal*, v. 12, June 1957, p. 644-652.

14483* (English.) **Microwave Studies of the Internal Motion and the Structure of Methyl Amine.** Tetsuji Nishikawa. *Physical Society of Japan, Journal*, v. 12, June 1957, p. 668-680.

14484* (English.) **Potential Barrier and Molecular Structure of Methyl Mercaptan From Its Microwave Spectra.** Takeshi Kojima and Tetsuji Nishikawa. *Physical Society of Japan, Journal*, v. 12, June 1957, p. 680-686.

14485* **On Solutions of He^3 and He^4.** S. K. Trikha and V. S. Nanda. *Progress of Theoretical Physics*, v. 17, May 1957, p. 679-710.

Agreement between theory and experiment concerning the λ-temperature of the solution, molar specific heat of mixing, vapor pressure in solution, distribution coefficient, and the measurements of vapor pressures at dew points is found to be satisfactory.

14486* **Ultrasonic Analysis of Molecular Relaxation Processes in Liquids.** R. O. Davies and J. Lamb. *Quarterly Reviews*, v. 11, no. 2, 1957, p. 134-161.

The thermodynamic theory of relaxation and the propagation of sound. Interpretation of absorption data for pure liquids and their binary mixtures.

14487* **Nuclear Quadrupole Coupling and Chemical Bonding.** W. J. Orville-Thomas. *Quarterly Reviews*, v. 11, no. 2, 1957, p. 162-188.

Considers the type of information about the chemical bond which can be obtained from quadrupole coupling constants.

14488* (Italian.) Isotope Exchange Reaction Between Benzoyl Peroxide and Potassium Benzoate. **Reazione di scambio isotopico tra perossido di benzoile e benzoato potassico.** Giovanni Giacometti and Antonio Iliceto. *Ricerca Scientifica*, v. 27, Mar. 1957, p. 743-750.

An approximate treatment was also developed for exchange kinetics in unstable systems when the disappearance of one of the reagents follows a first order reaction and the products formed do not reenter into the exchange.

14489 The Optical and Electrical Properties of Silver Azide and Their Relation to Its Decomposition. A. C. McLaren and G. T. Rogers. *Royal Society, Proceedings*, v. 240, ser. A, July 16, 1957, p. 484-498.

Measurements suggest that the absorption of light in the crystal produces excitons and that photoconductivity is a direct result of the dissociation of these excitons into free electrons and positive holes.

14490 (German.) Application of Radioactive Isotopes to the Study of Chemical Reactions, Especially on and Between Solid Substances. W. Buser. *Schweizer Archiv für Angewandte Wissenschaft und Technik*, v. 23, June 1957, p. 194-201.

Various methods and apparatus using isotopes in the study of selfdiffusion, diffusion in disperse bodies, transformations in solution, gas reactions, and rapid reactions of solid substances.

14491* **The Intensities of the Infra-Red Absorption Bands of *n*-Paraffin Hydrocarbons.** R. N. Jones. *Spectrochimica Acta*, v. 9, no. 3, 1957, p. 235-251.

14492* (German.) On the Technique and Methodology of Hydrothermal Crystal Cultivation. **Zur Technik und Methodik der hydrothermalen Kristallzüchtung.** Rudolf Mosebach. *Sprechsaal*, v. 90, July 1957, p. 324-326.

Equilibrium states in the system SiO-H_2O indicated by thermodynamic analysis of quantitative solubility data.

14493 Hydrothermal Synthesis of Electronically-Active Solids. Alfred Kremheller and Albert K. Levine. *Sylvania Technologist*, v. 10, July 1957, p. 67-71.

Electronically-active materials can be prepared using pressures up to several hundred atmospheres and temperatures considerably above the normal boiling points of the solutions. Process is based on the increase in solubility and reactivity with increase in temperature and involves solution, chemical reaction, and growth of crystallites with simultaneous incorporation of activator.

14494 Aqueous Chemistry of Ruthenium in the +2, +3, and +4 Oxidation States: Species, Spectra, and Potentials. Howard Hamilton Cady. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3757, June 1957, 81 p. (UF767 U3u Contin.)

14495* (Russian.) Phase Transformations in Normal Paraffin Hydrocarbons With Long Chains. **Fazovye prevrashcheniia v normal'nykh parafinovykh uglevodorodakh s dlinnymi tsepiami.** N. A. Nechitailo and G. B. Ravich. *Uspekhi Khimii*, v. 26, June 1957, p. 640-658.

Physical and physico-chemical properties of individual normal paraffins. Polymorphism is explained by structures and properties.

14496* (German.) Determination of Structure of Cyanuric Chloride $C_3N_3Cl_3$ by Means of X-Ray Diffusion for Determination of Molecular Orientation. **Strukturbestimmung von Cyanursäuretrichlorid $C_3N_3Cl_3$ mit Verwendung der diffusen Röntgenstreustrahlung zur Bestimmung der Molekülorientierungen.** W. Hoppe, H. U. Lenné, and G. Morandi. *Zeitschrift für Kristallographie*, v. 108, nos. 5-6, June 1957, p. 321-327.

The advantage of the combined use of strong as well as weak reflections for the selection of the parameters of the molecular translations is emphasized.

14497* (German.) Proof of Rod-Like Structure and Determination of 1,5,*N*-*N'*-Dipyrrolidylpentamethine Perchlorate Orientation of Organic Cation in Crystals With X-Ray Diffusion. **Nachweis der Stäbchengestalt und Orientierungsbestimmung des organischen Kations in 1,5,*N*-*N'*-Dipyrrolidylpentameth - inperchloratkristallen mit diffuser Röntgenstreustrahlung.** W. Hoppe and F. Baumgärtner. *Zeitschrift für Kristallographie*, v. 108, nos. 5-6, June 1957, p. 328-334.

14498* (English.) **Polytypism of Cadmium Iodide and Its Relationship to Screw Dislocations. II. Explanation of the Formation of Polytypes of Cadmium Iodide.** Richard S. Mitchell. *Zeitschrift für Kristallographie*, v. 108, nos. 5-6, June 1957, p. 341-358.

The screw dislocation theory of crystal growth supplies a satisfactory mechanism for generating the known structural polytypes of CdI_2.

14499* (English.) **Preliminary X-Ray Study of the Non-Ferroelectric Phases of Rochelle Salt.** F. Mazzi, F. Jona, and R. Pepinsky. *Zeitschrift für Kristallographie*, v. 108, nos. 5-6, June 1957, p. 359-374.

14500* (German.) Two Different Twin Laws of Pentaerythrite, $C(CH_2OH)_4$. **Zwei verschiedene Zwillingsgesetze bei Pentaerythrit, $C(CH_2OH)_4$.** M. Renninger. *Zeitschrift für Kristallographie*, v. 108, nos. 5-6, June 1957, p. 375-384 + 1 plate.

The twinning on (001) is detectable optically but not with X-rays, the twinning on (100) or (110) with X-rays, but not optically.

14501* (English.) **X-Ray Diffraction Study of α-Yohimbine, $C_{21}H_{26}O_3N_2$.** G. B. Mitra, S. K. Mitra, and M. G. Basak. *Zeitschrift für Kristallographie*, v. 108, nos. 5-6, June 1957, p. 385-388.

The unit cell was found to be hexagonal with $a = 23.75$ A. and $c = 15.71$ A. and contains 12 molecules.

14502* (German.) Twin-Crystal Formation in Vapor-Deposited Alkali-Halogen Layers of NaCl Type. **Zur Zwillingsbildung in aufgedampften Alkalihalogenid-Schichten vom NaCl-Typ.** Heinz Lüdemann. *Zeitschrift für Kristallographie*, v. 108, nos. 5-6, June 1957, p. 397-418.

A mechanism leading to twinning; growth of the twins.

14503* (English.) **The Crystal Structure of Diglycine Hydrochloride, $2(C_2H_5O_2N) \cdot HCl$.** Theodor Hahn and M. J. Buerger. *Zeitschrift für Kristallographie*, v. 108, nos. 5-6, June 1957, p. 419-453.

Structure was determined by solving the three-dimensional Patterson function for the distribution of electron density with the aid of an image-seeking polyhedron.

14504* (German.) The Problem of Energy Transport in Chemically Reacting Plasmas. **Zum Problem des Energietransports in chemisch reagierenden Plasmen.** H. J. Kaeppeler. *Zeitschrift für Physik*, v. 148, no. 4, 1957, p. 425-434.

Analytic integration of expression for reaction conversions critical for energy transport. Deviation from thermal equilibrium as a result of reaction exothermicity. Emphasis is on nonisothermal plasma.

14505* (German.) An Investigation of the Adsorption of Anions on Metallic Surfaces With the Help of Radioactive Indicators. **Untersuchung der Adsorption von Anionen an Metalloberflächen mit Hilfe radioaktiver Indikatoren.** K. Schwabe, K. Wagner, and Ch. Weissmantel. *Zeitschrift für Physikalische Chemie (Leipzig)*, v. 206, Apr. 1957, p. 309-320.

Description and evaluation of experiments on the adsorption of cyanogen and iodine ions, radioactively marked with C^{14} or I^{131}, on Pt, Ni, and Ag plates.

14506* (Russian.) The Thermodynamics of Liquid He^3. **Termodinamika zhidkogo He^3.** I. M. Khalatnikov and A. A. Abrikosov. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, v. 32, Apr. 1957, p. 915-919.

Entropy, heat capacity, and magnetic susceptibility are computed for two possible forms of the energy spectrum of the liquid.

14507* (Russian.) An Analysis of the Thermodynamic Properties of Argon, Nitrogen and Argon-Nitrogen Mixtures Using the Methods of Statistical Thermodynamics. **Analiz termodinamicheskikh svoistv argona, azota i argonoazotnoi smesi metodami statisticheskoi termodinamiki. II.** I. A. Rogovaia and I. P. Ishkin. *Zhurnal Fizicheskoi Khimii*, v. 31, Mar. 1957, p. 573-581.

14508* (Russian.) Mixed Adsorption Catalysts. **Smeshannye adsorbtsionnye katalizatory. IV.** The Activity of Mixed Catalysts on Alkaline Earth Metal Carbonates in the Reduction of *m*-Nitrophenol. **Aktivnost' smeshannykh metallicheskikh katalizatorov na karbonatakh shchelochnozemel'nykh metallov pri vosstanovlenii *m*-nitrofenola.** I. A. Zubovich. *Zhurnal Fizicheskoi Khimii*, v. 31, Mar. 1957, p. 589-598.

A study of the catalytic activity of Pt-Cu, Pt-Ag, Pt-Au, Pd-Cu, Pd-Ag, Pd-Au, and Pt-Pd catalysts on alkaline earth carbonates, also of Pt-Cu and Pd-Cu catalysts on $BaSO_4$.

14509* (Russian.) The Tautomerism of Some Derivatives of Heterocyclic Compounds. **O tautomerii nekotorykh proizvodnykh geterotsiklicheskikh soedinenii. III.** The Spectra and Structures of *n*-Dioxy Derivatives of Pyridazine and Phthalazine. **Spektry i stroenie *n*-dioksiproizvodnykh piridazina i ftalazina.** Iu. N. Sheinker, T. V. Gortinskaya, and T. P. Sycheva. *Zhurnal Fizicheskoi Khimii*, v. 31, Mar. 1957, p. 599-611.

14510* (Russian.) The Thermodynamics of Molten Mixtures of Alkaline Metal Chlorides and Thorium Tetrachloride. **Termodinamika rasplavlennykh smesei khloridov shchelochnykh metallov i toriia.** M. V. Smirnov and L. E. Ivanovskii. *Zhurnal Fizicheskoi Khimii*, v. 31, Mar. 1957, p. 641-647.

14511* (Russian.) Electron Diffraction Studies of Molecular Structure. **Elektronograficheskoe issledovanie stroeniia molekul. VI.** Calcium Halides. **Galogenidy kal'tsiia.** P. A. Akishin, V. P. Spiridonov, and G. A. Sobolev. *Zhurnal Fizicheskoi Khimii*, v. 31, Mar. 1957, p. 648-652.

In the CaCl, CaBr, and CaI molecules the metal to halogen distance was shown to change linearly with the ordinal number of the halogen, the CaF distance exhibiting a marked deviation from this rule.

14512* (Russian.) The Equilibrium Between Tungsten Oxides and Hydrogen. **Ravnovesie okislov vol'frama s vodorodom.** I. A. Vasil'eva, Ia. I. Gerasimov, and Iu. P. Simanov. *Zhurnal Fizicheskoi Khimii*, v. 31, Mar. 1957, p. 682-691.

The existence of two temperature modifications of WO_3 was confirmed. A set of interplanar distances is presented for the oxides $WO_{2.90}$, $WO_{2.72}$, and WO_2, formed on reducing the high temperature modification WO_3. Reduction of WO_3 over the range 600-791 C takes place in four stages, whereas at temperatures below 584 C it occurs in three stages, with the disappearance of the oxide $WO_{2.72}$.

14513* (Russian.) Liquid-Vapor Phase Equilibria in Binary Mixtures of Styrene, Ethylbenzene and *N*-Propyl Alcohol. **Fazovye ravnovesiia zhidkost'-par v binarnykh smesiakh stirola, etilbenzola i *n*-propilovogo spirta.** V. A. Malisov, N. A. Malafeev, and N. M. Zhavoronkov. *Zhurnal Fizicheskoi Khimii*, v. 31, Mar. 1957, p. 699-703.

The system styrene–*n*-propyl alcohol forms, at 50 mm. Hg, and azeotrope boiling at 38.5 C, containing 90 mole % *n*-propyl alcohol. The system ethylbenzene–*n*-propyl alcohol forms an azeotrope boiling at 38 C and containing 74.5 mole % *n*-propyl alcohol.

14514* (Russian.) Studies on the Porous Structures of Solids by Sorption Methods. **Issledovanie poristoi struktury tverdykh tel sorbtsionnynai metodami. III.** Gravimetric Methods of Determining Sorption and Desorption Isotherms of Nitrogen and Benzene Vapors. **Vesovye metody izmereniia izoterm sorbtsii i desorbtsii parov azota i benzola.** B. P. Bering, M. M. Dubinin, E. G. Zhukovskaia, A. I. Sarakhov, and V. V. Serpinskii. *Zhurnal Fizicheskoi Khimii*, v. 31, Mar. 1957, p. 712-716.

Apparatus permits the gravimetric determination of the adsorption of N vapors at 195 C and hydrocarbon vapors at room temperatures.

14515* (Russian.) The Mechanism of Heterogeneous Catalysis and the Kinetics of Catalytic Dehydrogenation. **Mekhanizm geterogennogo kataliza i kinetika kataliticheskoi degidrogenizatsii.** A. A. Balandin. *Zhurnal Fizicheskoi Khimii*, v. 31, Apr. 1957, p. 745-769.

Theoretical discussion based on a literature survey.

14516* (Russian.) State of Microquantities of the Radioelements in Solutions. **Sostoianie mikrokolichestv radioelementov v rastvorakh. III.** State of Zr^{95} in Aqueous Solutions. **Sostoianiie Zr^{95} v vodnykh rastvorakh.** I. E. Starik, A. P. Ratner, I. A. Skul'skii, and K. A. Gavrilov. *Zhurnal Neorganicheskoi Khimii*, v. 2, May 1957, p. 1175-1182.

Study of the properties of Zr^{95} in nitrate and ammonium solutions.

See also: **14177** (difference in steam pressure of isotopic compounds); **14977** (oxidation of Cu); **15253** (luminescence in organic solids); **15403** (photochemical processes).

COATINGS

14517 Polyurethanes—Another Challenge to the Paint Maker. William Brushwell. *American Paint Journal*, v. 41, July 15, 1957, p. 107 + 9 pages.

Protective coatings based on the interaction of di-poly or polyisocyanates with a wide variety of polyesters are described.

14518 Depth of Sulphur-Enriched Zone Produced When Sulphidizing Steel and Cast Iron. G. V. Karpenko, A. N. Tynnyi, and Iu. I. Babei. *Henry Brutcher Translation No.* 3932, 5 p. (From *Vestnik Mashinostroeniia*, v. 37, no. 2, 1957, p. 61-62.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 6830, v. 6, May 1957.

14519 The Aging of Evaporated Silver Films. R. A. Aziz and G. D. Scott. *Canadian Journal of Physics*, v. 35, July 1957, p. 785-791.

Spontaneous aging of thin films was studied by following electrical resistance variations with time immediately after deposition *in vacuo*.

14520 How to Decorate Aluminum Enamels. Paul A. Huppert. *Ceramic Industry*, v. 69, July 1957, p. 58 + 2 pages.

A summary of processes, materials, and application methods.

14521* "Epikote" Resin Based Coatings. A General Review. D. H. Nicholson. *Corrosion Prevention & Control*, v. 4, Mar. 1957, p. 55 + 7 pages.

Ester systems; amine-cured systems; tank coatings; use against marine corrosion.

14522 Measuring the Thickness of Sprayed Metal Coatings. R. E. Mansford. *Electroplating and Metal Finishing*, v. 10, July 1957, p. 208 + 5 pages.

Commercially available instruments are compared.

14523 Surfacing With Stainless Prevents Pit Corrosion. J. A. Rau. *Iron Age*, v. 180, July 18, 1957, p. 120-121.

Pitted shafts of extrusion presses are restored by a welding technique which deposits a stainless steel bead that can be machined to a near-mirror finish.

14524* Modification of Kamala Seed Oil for Varnishes & Paints. V. N. Ojha, P. G. Sharma, and J. S. Aggarwal. *Journal of Scientific and Industrial Research*, v. 16, sec. A, May 1957, p. 213-216.

Benzene-extracted kamala seed oil on alcoholysis with monohydric alcohols yields modified oil having gelation properties similar to those of tung oil.

14525* Substrate Influence on the Texture of Cadmium Films. A. R. Déo and M. K. Gharpurey. *Journal of Scientific & Industrial Research*, v. 16, sec. B, May 1957, p. 190-194.

Cadmium deposition by condensation *in vacuo* of its vapor on various substrates was examined. The critical vapor density and resultant deposit textures are greatly affected by the nature of the substrate.

14526 Gaseous Deposition Techniques. M. K. Hargreaves. *Machinery Lloyd (Overseas Ed.)*, v. 29, July 6, 1957, p. 70 + 4 pages.

Vacuum evaporation and sputtering techniques.

14527 Zinc-Rich Paints Protect Iron and Steel Parts. Robert J. Fabian. *Materials in Design Engineering*, v. 46, July 1957, p. 102-104.

Large structures can be readily "galvanized" by simply painting on a suspension consisting mainly of metallic Zn.

14528* (Italian.) The Sherardizing Process. Influence of Part Shape on the Depth of Sherardized Layers and on Their Corrosion Resistance. **Il processo di sherardizzazione: influenza della forma dei pezzi sulla profondità degli strati sherardizzati e sulla loro resistenza alla corrosione.** L. Matteoli and F. Barigozzi. *Metallurgia Italiana*, v. 49, May 1957, p. 355-362.

Some experiences with the sherardizing of hollow and tubular items.

14529 Hot Pressure Bonding. S. Storchheim. *Metal Progress*, v. 72, July 1957, p. 97-101.

Technique is useful in cladding a wide variety of metals. Experimental investigation shows that bonding pressure is a critical factor, and affects the microstructure and thickness of the intermetallic diffusion zone.

14530 Mechanism of Linseed Oil Film Degradation Under Ultra-Violet Irradiation. S. B. Crecelius, A. L. Alexander, and R. E. Kagarise. *Naval Research Laboratory, Report* 4803, July 1956, 12 p. (T21 Un3.5n Contin.)

Two films of linseed oil, one thick and the other relatively thin, were irradiated with ultraviolet light in a closed cell filled with oxygen. Data indicate that the films break down into CO_2, CO, and low mol. wt. aldehydes and ketones.

14531* Some Observations on the Gas Checking of Stoving Epoxide Systems. G. Swift and R. E. Stolton. *Official Digest. Federation of Paint and Varnish Production Clubs*, v. 29, July 1957, p. 664-683.

Causative factors; test apparatus; results of tests on Epikote resin/urea and Epikote resin ester/melamine resin systems; effect of "curing agent C" against gas checking.

14532* Reclamation of Off Quality "In-Process" Batches. H. Kredentser, S. E. Bertsch, H. Kraus, E. Pyves, and A. Shore. *Official Digest. Federation of Paint and Varnish Production Clubs*, v. 29, July 1957, p. 684-693.

A compilation of procedures suggested for the reclamation of coating materials with various types of faults.

14533* The Influence of Soybean Lecithin on the Pigment Dispersion in Alkyd Paints. Max Kronstein. *Paint Industry Magazine*, v. 72, June 1957, p. 10 + 6 pages.

14534* Weather Variables Which Affect Paint Exposures. John A. Gordon, Jr. *Paint Industry Magazine*, v. 72, June 1957, p. 30 + 3 pages.

14535 Paint and Lacquer Additives. III. W. F. Daggett. *Paint Manufacture*, v. 27, July 1957, p. 263-266.

Finishes can be formulated to have improved characteristics by the incorporation of small quantities of additives.

14536* Phosphating Processes and Their Applications in Metal Finishing. II. Choice of Plant. D. J. Fishlock. *Product Finishing*, v. 10, July 1957, p. 73-85.

Preparatory cleaning arrangements; details of plant required for phosphating.

14537* Vitreous Enamelling on Aluminium. II. Application of Vitreous Enamels on Aluminium. A. H. Symonds. *Product Finishing*, v. 10, July 1957, p. 90-93.

Choice of alloy; spraying methods and equipment; dipping; drying; firing; testing methods.

14538* Unusual Technique Reduces Abrasive Wear. *Rock Products*, v. 60, July 1957, p. 94 + 1 page.

Hardfacing improves wear resistance of cement kiln die rings.

14539 Perfection of Contour by Vacuum Deposited Thin Films. S. Tolansky. *Vacuum*, v. 4, June 1957, p. 456-463.

The fidelity of contouring of surface micro-steps by evaporated thin deposits of Ag, cryolite, and ZnS is studied by precision multiple-beam interferometry.

14540* (Russian.) Sulfurizing in the Machinery Industry. **Sul'fidirovanie v mashinostroenii.** L. Iu. Pruzhanskii. *Vestnik Mashinostroeniia*, v. 37, June 1957, p. 87-88.

Description of methods of sulfurizing used in the SSSR.

14541* (Polish.) Oxidation of Metals at High Temperatures. **Utlenianie metali w wysokich temperaturach.** Stanislaw Mrowec, Dominik Majszel, and Teodor Werber. *Wiadomości Chemiczne*, v. 11, Feb. 1957, p. 95-127.

A theoretical study of oxide coatings on metallic surfaces. Structure, electric conductivity, and formation kinetics.

14542* (Russian.) Application of X-Ray Analysis in Investigation of Sulfuring of Steel. **O primenenii rentgenostrukturnogo analiza pri issledovanii sul'fidirovaniia stalei.** Iu. M. Vinogradov and V. D. Zelenova. *Zavodskaia Laboratoriia*, v. 23, June 1957, p. 697-699.

See also: **14132** (coating ceramics); **14264** (analysis of alkyd resins); **14878** (color measurement); **14975** (oxide films on Al); **15031** (pretreatment of steel); **15084** (thermoelectric properties of Al and Co films); **15095** (properties of Ni films); **15203** (structure of evaporate Al, Ag, and Au films); **15208** (oxide films on hard alloys).

CONTROL SYSTEMS, COMPUTERS, AND SYSTEMS ENGINEERING

14543* (French.) On a New Computing Process Using High-Frequency Currents. **Sur un nouveau procédé de calcul par courants de haute fréquence. II.** Generation of Monovariable Functions. **Génération des fonctions monovariables.** H. J. Uffler and J. Tubeuf. *Annales de Radioélectricité*, v. 12, Apr. 1957, p. 140-151.

14544* Modern Computer Analysis for the Design of Steel Mill Contr ' Systems. J. E. Reider and Philip Spergel. *Applications and Industry*, no. 31, July 1957, p. 105-110.

14545* Transfer Matrix Stability Criterion Applied to an Amplidyne Servo Network. Pierre M. Honnell and Daniel Wolffenstein. *Applications and Industry*, no. 31, July 1957, p. 143-149.

Agreement between the mathematical predictions and the physical performances, with allowances for the necessary idealizations introduced to render the analysis tractable.

14546* Design and Use of Hydraulic Servo Systems. Murray Kanes. *Automation Progress*, v. 2, July 1957, p. 320-323.

The hydraulic servo is compared with a mechanical type. Steady-state and dynamic characteristics of oil servo motors are analyzed theoretically. (To be continued.)

14547* Electronic Controllers for Industry. E. R. Thomas. *Automation Progress*, v. 2, July 1957, p. 324 + 4 pages.

Some examples of electronic control devices as used in industrial processes.

14548* (Russian.) Determination of Transfer Function Coefficients of Linearized Units and Control Systems. **Opredelenie koeffitsientov peredatochnykh funktsii linearizovannykh zven'ev i sistem avtoregulirovaniia.** M. P. Simoiu. *Avtomatika i Telemekhanika*, v. 18, no. 6, June 1957, p. 514-528.

Method for determination of approximate values of complicated functions from experimental curves of more elementary types.

14549* Backlash and Hysteresis Effects in Automation Systems. L. M. Vallese. *British Institution of Radio Engineers, Journal*, v. 17, June 1957, p. 315-318.

Non-linearities of backlash and of hysteresis type provide generally different types of stability limits in feedback control systems. These limits and the corresponding frequencies of oscillation may be expressed in terms of characteristic adimensional system parameters. Examples of application to second and third order systems are shown.

14550 Servo Modulators. I. Where and Why They're Used, Characteristics of the Basic Types. Basil T. Barber. *Control Engineering*, v. 4, Aug. 1957, p. 65-71.

Discusses six broad classes of control system applications; tabulates the important performance specifications of the various types of servo modulators.

14551 The Digital Answer to Data Telemetering. E. A. Ragland and D. E. Wassall. *Control Engineering*, v. 4, Aug. 1957, p. 95-101.

Digital systems based on binary code techniques offer maximum accuracy and versatility plus the most efficient use of the time-bandwidth factor. The characteristics and requirements of digital data transmission systems are discussed.

14552 Digital Computer Programming. D. D. McCracken. 253 p. 1957. John Wiley & Sons, New York. (TK7872.C5 M13d)

Basic fundamentals for the person who needs to know how problems are solved on a modern stored program computer. Includes data on number systems, coding, decimal methods, and address and loop computation.

14553* Views Systems Planning Trends. *Electrical World*, v. 148, July 15, 1957, p. 75 + 7 pages.

Summary of system planning practices of 46 electric companies in 1955.

14554 Lace (The Luton Analogue Computing Engine). I. R. J. Gomperts and D. W. Righton. *Electronic Engineering*, v. 9, July 1957, p. 306-312.

Requirements and construction of general purpose analog computer. (To be continued.)

14555 Choosing a Missile Guidance and Control System. Robert W. Mayer. *Electronic Equipment*, v. 5, July 1957, p. 36-39.

Analysis of pertinent variable; criteria for making a wise chioce.

14556 Magnetic Computer Has High Speed. T. H. Bonn. *Electronics*, v. 30, Aug. 1, 1957, p. 156-160.

Complementing series-type amplifiers handle information rates up to 2.5 mc. in an all-magnetic computer operating at 660-kc. information rate. Design considerations included in the 1,500 magnetic amplifier circuits and various types of core materials and their figures of merit are presented.

14557 Computerized Production Control. *Factory Management and Maintenance*, v. 115, July 1957, p. 84-90.

Use of computers for preparation of control information, material breakdown, inventory control, ordering, manufacturing planning and scheduling, and follow-up.

14558* (German.) Electronic Computing Machines. **Elektronische Rechenmaschinen.** Werner Taeger. *Frequenz*, v. 11, June 1957, p. 185-191.

Elements of control circuits; relation between cutoff and characteristic coefficients of ordinary computing machines; electronic arrangements for the solution of mathematical and physical problems.

14559* Development of the Permissive-Make Relay. B. J. Greenblott and J. E. Wallace. *IBM, Journal of Research and Development*, v. 1, July 1957, p. 198-211.

This general-purpose relay designed specifically to meet the demands of business machines, gives life, reliability, low cost, speed, and low power input. The design provides adjustment-free assembly, control of contact wipe, and elimination of bounce.

14560* Two-Collector Transistor for Binary Full Addition. R. F. Rutz. *IBM, Journal of Research and Development*, v. 1, July 1957, p. 212-222.

Design and operational features of two versions of a new multielectrode transistor which serves as a full adder for binary numbers in computer circuits.

14561 Dynamic Accuracy as a Design Criterion of Linear Electronic-Analog Differential Analyzers. Amos Nathan. *Institute of Radio Engineers, Transactions on Electronic Computers*, v. EC-6, June 1957, p. 74-86. (TK1 In6.6e Vis.)

14562 Trigonometric Resolution in Analog Computers by Means of Multiplier Elements. R. M. Howe and E. G. Gilbert. *Institute of Radio Engineers, Transactions on Electronic Computers*, v. EC-6, June 1957, p. 86-92. (TK1 In6.6e Vis.)

A method of generating sine and cosine functions was successfully used to compute Euler angles in analog computer solutions of the three-dimensional flight equations.

14563 A New Diode Function Generator. T. Miura, H. Amemiya, and T. Numakura. *Institute of Radio Engineers, Transactions on Electronic Computers*, v. EC-6, June 1957, p. 95-100. (TK1 In6.6e Vis.)

Functions are generated by connecting independent line segments.

14564 An Algorithm for Determining Minimal Representations of a Logic Function. Bernard Harris. *Institute of Radio Engineers, Transactions on Electronic Computers*, v. EC-6, June 1957, p. 103-108. (TK1 In6.6e Vis.)

A method for constructing the minimal representations of a logic function given as a truth-table or in one of its canonical forms. The utility of the method lies in the conciseness of notation, which permits the handling of a large number of variables and simplifies the process for machine computation.

14565 Computing Techniques for the Sampling Parametric Computer. C. J. Hirsch and F. C. Hallden. *Institute of Radio Engineers, Transactions on Electronic Computers*, v. EC-6, June 1957, p. 108-119. (TK1 In6.6e Vis.)

Novel calculating techniques suitable for an electronic analog computer using exponential discharges to simulate the logarithmic scales of the slide rule.

14566 An Electronic Computer for Vector Electrocardiography. Robert DeCote and William J. Horvath. *Institute of Radio Engineers, Transactions on Medical Electronics*, PGME-8, July 1957, p. 31-37. (TK1 In6.6m Contin.)

14567* Automation of Environmental Testing. Virlyn W. Walter. *ISA Journal*, v. 4, July 1957, p. 286-289.

Fully automated measuring and data handling systems are described.

14568* (German.) Continuous Control Methods in Industrial Production. **Kontinuierliche Prüfmethoden in der industriellen Fertigung.** M. Dühmke. *Metall*, v. 11, July 1957, p. 579-582.

Random sample control, automatic measurement, stoppage of production process by the measuring apparatus, guidance and operation of machines.

14569 Charactron Shaped Beam Tube. Donald T. Olmsted. *Military Automation*, v. 1, May-June 1957, p. 138-140.

Provides high-speed readout from computers or other data sources having readout rates of 5000 to 20,000 characters per sec.

14570 Modern Digital Techniques. Milton H. Aronson and Martin L. Klein. *Military Automation*, v. 1, May-June 1957, p. 152-159.

Programming of five leading medium-size general-purpose computers for a simple arithmetic operation. (To be continued.)

14571 The Use and Cost of Analog Computers. Ernest A. Goetz. *Military Automation*, v. 1, May-June 1957, p. 160-163.

14572 Servos. Kenneth L. King and Claude O. Morrison. *Military Automation*, v. 1, May-June 1957, p. 166-167.

Fundamental aspects and applications of servomechanisms. (To be continued.)

14573 Mathematics Panel Semiannual Progress Report. A. S. Householder. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2283, June 1957, 32 p. (UF767 U3o Contin.)

Report on recent use of Oracle computer, and methods developed to increase efficiency in high speed computations.

14574 Automation Raises Power Supply Problems. *Power Engineering*, v. 61, July 1957, p. 73.

Problems due to voltage variations and short-time interruptions are considered.

14575 Proceedings of the First Automation Conference, February 14-15, 1956. 116 p. Armour Research Foundation of Illinois, Institute of Technology, Chicago. (T59.5 Ar55p)

Papers from a conference designed to acquaint executives with the concepts of automation which are gaining increasing importance throughout industry. Techniques and specific case histories are included.

14576 Servosystems Laboratory Manual. 32 p. 1957. Servo Corporation of America, New York. (TJ213 Se69s)

A manual intended to serve as the framework of a laboratory course in fields such as servomechanisms, feedback control systems, or principles of controls. Practical applications of principles are stressed in integrated experiments.

14577* Cytac—A Multi-Purpose Precision Navigation System. Wilbert P. Frantz. *Sperry Engineering Review*, v. 10, May-June 1957, p. 2-6.

A radio navigation system of long range and high accuracy for both air and surface travel.

14578* (Russian.) Outlook for the Application of Calculating Machines for Blast Furnace Performance Automatic Control. **Perspektivy ispol'zovaniia vychislitel'nykh mashin pri avtoregulirovanii khoda domennoi pechi.** I. A. Rylov. *Stal'*, v. 17, June 1957, p. 488-493.

Use of intermittent operation numeral calculating machines in blast furnace control systems.

14579 A Note on Least-Squares Fitting of Atomic-Beam Resonance Curves. Henry B. Silsbee. *University of California, Raidation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3723, Mar. 1957, 13 p. (UF767 U3u Contin.)

A routine is described for fitting bell-shaped curves to data points by use of the IBM 650 computer.

14580 ATBAC—An IBM-704 Code for Reactor Thermal Transients. Betty L. Anderson, Thomas J. Lawton, Joseph M. Weaver, and Edward V. Somers. *Westinghouse Electric Corporation, Atomic Power Division (U. S. Atomic Energy Commission)*, WAPD-TM-20, June 1957, 56 p. (UF767 Un3.1wa Contin.)

A method for using an electronic data processing machine to obtain detailed information concerning thermal conditions within a reactor core curing transient operations.

See also: **14609** (networks for information transmission); **14720** (automation and technological change); **14866** (electronic chemical structure sorter); **14869** (literature processing); **14873** (information handling systems); **14875** (mechanical management of information); **14880** (role of automation in U. S. economy); **15331** (computer in operations research studies); **15465** (cooling electronic computers).

ELECTRICAL ENGINEERING

14581* (English.) **On a Method of Producing Strong Magnetic Fields of Short Duration.** A. Piekara and J. Malecki. *Acta Physica Polonica*, v. 15, no. 6, 1956, p. 381-388.

Magnetic fields of a duration of the order of 50 μ sec. are produced using a condenser battery of a capacity of 2 μ F charged up to 50 kv. The fields attained intensity up to 350,000 oersteds in a volume of about 1 cc.

14582* (English.) **Surface Wave Propagation Along Coated Wires.** T. Berceli. *Acta Technica Academiae Scientiarum Hungaricae*, v. 17, nos. 3-4, 1957, p. 219-252.

Problems of wave propagation along wires, the coating of which has dielectric and magnetic properties. The dielectric loss of the coating decreases with the increase of the dielectric constant while its magnetic loss increases as the magnetic permeability augments. Procedure for designing surface wave transmission lines is illustrated.

14583* Protecting A-C Motors With Low-Voltage Air-Circuit-Breaker Series Trips. F. P. Brightman, R. R. McGee, and P. J. Reifschneider. *Applications and Industry*, no. 31, July 1957, p. 114-119.

Study indicates that fairly accurate information as to motor-starting current, starting time, and stalled-rotor time is needed in order to intelligently apply and adjust direct-acting series-tripping mechanisms on low-voltage circuit breakers.

14584* Selection of Buffer Reactors and Synchronous Condensers on Power Systems Supplying Arc-Furnace Loads. C. Concordia, L. G. Levoy, and C. H. Thomas. *Applications and Industry*, no. 31, July 1957, p. 123-135.

The influence of the system parameters, including buffer reactance, condenser size, system reactance, and amount of additional steady loads such as furnaces in the refining stage of the melt, are considered simultaneously with shock loading produced by a furnace operating in the melt-down stage.

14585 Twelve-Channel Military Carrier: Order Circuit and Maintenance. H. C. Fleming. *Bell Laboratories Record*, v. 35, July 1957, p. 264-267.

Portable telephone system transmits 12 message channels over cable or radio links for distances up to 200 miles between terminals. For adjusting and maintaining the system, an "extra" channel or order circuit is included, along with all the circuits required in making a large number of easily performed tests.

14586* New Motors for Machine Tool Versatility. L. W. Herchenroeder. *Canadian Metalworking*, v. 20, June 1957, p. 24 + 1 page.

Recent developments in d.c. motors designed to exploit their characteristic versatility in control of speed, accleration, braking, reversing, and torque.

14587 The Metallurgical Aspects of "Resistance". T. P. Wang and E. T. Kubilins. *Electronic Industries & Tele-Tech*, v. 16, July 1957, p. 52 + 6 pages.

Resistance of a wire is determined by the alloys and heat treatment used in its manufacture, as well as subsequent deformation and elastic strains.

14588* (Russian.) Large Synchronous Motors With Solid Poles on Their Rotors. **Moshchnye sinkhronnye elektrodvigateli s massivnymi poliusami na rotore.** Z. B. Neiman. *Elektrichestvo*, no. 6, June 1957, p. 32-34.

Overheating and wear in high r.p.m. superchargers, pumps, etc., requiring powerful electric motors, were corrected by using weight-increasing solid poles on rotors.

14589* (Russian.) High Voltage Autotransformers. **Vysokovol'tnye avtotransformatory.** A. G. Kraiz. *Elektrichestvo*, no. 6, June 1957, p. 39-44.

Operating conditions; voltage control; overvoltages; performance; construction.

14590* (Russian.) Effect of the Corrosion of DC Transmission Lines of the "Ground Lead" Type on Trunk Cables. **Korrozionnoe vliianie tokov linii elektroperedachi postoiannogo toka sistemy "provd-zemlia" na kabeli sviazi.** M. I. Mikhailov and K. K. Nikol'skii. *Elektrosviaz'*, v. 11, July 1957, p. 68-72.

14591* Electrical Energy From the Wind. E. W. Golding. *Enigneering Journal*, v. 40, June 1957, p. 809-819.

Wind-power characteristics; wind-driven machines; recent research and development.

14592 (English.) **Quasichemical Equilibrium Approach to Superconductivity.** M. R. Schafroth, S. T. Butler, and J. M. Blatt. *Helvetica Physica Acta*, v. 30, nos. 2-3, 1957, p. 93-134.

A new approximation method for the partition function of a system of interacting Fermi particles.

14593* Elements of High Frequency Fluorescent Lighting. J. H. Campbell. *Illuminating Engineering*, v. 52, July 1957, p. 337-342.

An outline of some of the important characteristics of the component parts as an aid to proper engineering appraisal of the system.

14594* Developments in Marine Electrical Installations With Particular Reference to A.C. Supply. A. N. Savage. *Institute of Marine Engineers, Transactions*, v. 69, June 1957, p. 217-255.

The adoption of a 440-volt 3-phase a.c. system, properly planned and carried out, will result in a safer and more reliable system, together with a far more economical use of valuable raw materials.

14595* Development of a Rotation Isolator for 6cm Wavelength. P. E. Ljung. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, Suppl. 6, 1957, p. 362-363.

Constructional data on an isolator using Faraday rotation in a circular waveguide.

14596* Electrode Design for Dielectric Heaters. N. H. Langton and E. E. Gunn. *Institution of the Rubber Industry, Transactions*, v. 33; *Proceedings*, v. 4, June 1957, p. 95-104.

Apparatus consists essentially of a R.F. generator, producing oscillations at a frequency of about 18 mc. per sec. or higher, with a power output of several kw. The H.F. output is fed into a condenser in a screening cage, between the plates of which is placed the material to be heated, which becomes the dielectric.

14597* (Russian.) On the Theories of the Microscopic Ferroelectric Properties of Barium Titanate. **O mikroskopicheskikh teoriiakh segnetoelektricheskikh svoistv titanata bariia.** R. E. Pasynkov. *Izvestiia Akademii Nauk SSSR, Seriia Fizicheskaia*, v. 21, Mar. 1957, p. 340-351.

Mathematical analysis.

14598 Electrical Conductivity of Fused Quartz. Julius Cohen. *Journal of Applied Physics*, v. 28, July 1957, p. 795-800.

The conductivities of two specimens of clear fused quartz were measured *in vacuo* in the temperature range of 600 to 1400 C. Marked contrasts in the behavior of the two specimens are due to differences in the impurity contents.

14599 Dielectric Dispersion in Viscous Polar Liquids. J. W. Winslow, Jr., R. J. Good, and P. E. Berghausen. *Journal of Chemical Physics*, v. 27, July 1957, p. 309-312.

Dispersion was studied over the range 50 cycles to 100 kc. for tolyl xylyl sulfone, pentachlorobiphenyl, hexachlorobiphenyl, and solutions of tolyl xylyl sulfone in supercooled *o*-terphenyl.

14600 (English.) **Fractional-Slot Windings for Three-Phase Synchronous Machines and Their Properties at Load.** Emil Alm. *Kungl. Tekniska Högskolans Handlingar (Transactions of the Royal Institute of Technology, Stockholm, Sweden)*, no. 111, 1957, 42 p. (T4 K96t Vis.)

A fractional-slot winding increases the probability of finding a winding for a given voltage with a given type of winding and a given number of conductors per slot.

14601* Fault Rating of Electrical Equipment. *Mechanical World and Engineering Record*, v. 137, July 1957, p. 304-307.

Calculating the power that can be developed at an electrical short-circuit, for the purpose of ascertaining whether any modification of existing protective switchgear is necessary to ensure adequate provision for clearing such faults.

14602* (German.) Rectifying Installations in Modern Rolling Mills. **Stromrichter-Anlagen in modernen Walzwerken.** Hans-Joachim Mau. *Neue Hütte*, v. 2, May 1957, p. 299-307.

Comparison between rectifying drives and drives with rotary converters and amplifiers. Application of rectifying drives in continuous mills.

14603* Defining Induction Motor Torques. R. C. Moore. *Plant*, v. 16, July 1957, p. 68-71.

Standard definitions of some of the most frequently encountered torques, particularly the breakdown, pull-up, and locked rotor types.

14604* Higher D-C Voltages Applied to Insulation Field Tests. Stuart C. Sommer. *Plant*, v. 16, July 1957, p. 72-73.

Advantages include less destruction of sound insulation, smaller test equipment required, and the possibility of combining various tests.

14605 Transductors Solve Tough D-C Metering Problems. M. J. Brown. *Power Engineering*, v. 61, July 1957, p. 52-54.

Fundamentals and applications of the unit.

14606 Shaded-Pole Motors. R. E. Schuette and C. G. Johnson. *Product Engineering*, v. 28, July 1957, p. 169-175.

Recent design advances and added applications have made these units available in larger sizes, up to 1/6 hp.

14607 Electroluminescence. Henry F. Ivey. *Scientific American*, v. 197, Aug. 1957, p. 40-47.

When a luminescent substance such as ZnS is placed in an alternating electric field it emits light. This effect makes possible thin illuminating panels and many other useful devices.

14608* (Dutch.) Ratio Between the Yoke and the Leg Section and the Shape of the Yoke Section in Single Phase and Three Phase Core Type Transformers. **Over de keuze van de verhouding tussen juk- en kerndoorsnede en de vorm van de jukdoorsnede bij eenfaze en driefazen kerntransformatoren.** C. E. M. de Kuijper. *Smit Mededelingen*, v. 12, Apr.-June, 1957, p. 40-47.

Influence of the ratio of the yoke and the leg section on the iron loss of single phase and three phase core type transformers. Results of two methods of calculation are compared.

14609 Transmission Circuits. Everard M. Williams and James B. Woodford, Jr. 156 p. 1957. Macmillan Co., New York. (TK3226 W67t)

Principles of electric networks and conductor systems for energy and information transmission.

14610 Self-Excited Oscillations in the Positive Column of a Gaseous Discharge. M. E. Gertsenshtein. *U. S. Atomic Energy Commission*, AEC-tr-2723, 9 p. (Translated from *Zhur. Eksptl. i Teort. Fiz. I. Exptl.-Theoret. Phys., USSR*, v. 23, no. 6, 1952, p. 669-677.) (UF767 Un3.1ae Contin.)

Oscillation properties of the plasma are determined from the sum of the electron and ion distribution functions in which the ion function appears with the coefficient m/M; for self-excited oscillations to occur it is necessary that the sum have at least two maxima.

14611 Reflex Discharges in Hydrogen. Edmund S. Chambers. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-4830, Feb. 1957, 20 p. (UF767 U3u Contin.)

Electrical discharges in a magnetic field were studied in H at pressures between 1 and 10μ Hg.

14612 D-C Motors. C. B. Hathaway and F. E. Spindler. *Westinghouse Engineer*, v. 17, July 1957, p. 98-102.

Insulation; specifications; ventilation; protection; performance.

14613 Application of Load-Break Switches and Automatic Grounding Switches. C. W. Upton. *Westinghouse Engineer*, v. 17, July 1957, p. 103-105.

Sulfur hexafluroide gas, as an arc suppressing medium, has made possible these two switchgear devices.

14614 Modern Concepts of Relay Design. G. J. Marieni and W. Stepanuk. *Westinghouse Engineer*, v. 17, July 1957, p. 114-119.

Several design improvements for overcurrent, directional, and voltage relays.

14615 Motocylinders. A New Tool for Machine Designers. P. A. Rabideau. *Westinghouse Engineer*, v. 17, July 1957, p. 126-128.

This versatile drive, easily applied, can be used for machines that require reciprocating or oscillating motion.

14616* (German.) Electrical Conductivity Measurements of Silver Halogenide Monocrystals. **Elektrische Leitfähigkeitsmessungen an Halogensilber-Einkristallen.** R. Matejec. *Zeitschrift für Physik*, v. 148, no. 4, 1957, p. 454-495.

Relation of conductivity to temperature of various Ag halogenide monocrystals. Displacement of interstitial Ag ions and a direct measurement of activation energies.

14617* (Russian.) Electrification of Bodies After Their Coming Into Contact. **Elektrizatsiia, obnaruzhivaemaia posle soprikosnoveniia duykh tel.** M. M. Bredov and I. Z. Kshemianskaia. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, May 1957, p. 921-928.

Measurement of the electric charge occurring after two metals or a metal and a semiconductor come into contact.

See also: **14634** (lead-acid batteries); **14701** (power system communications); **14844** (performance of steam turbine generators); **14850** (measuring efficiency of electricity generation); **14856** (steam generating plant); **14963** (tungsten lamp filaments); **15140** (rolling mill equipment); **15517** (welded electric machines).

ELECTROCHEMISTRY

14618* (English.) **Electroorganic Preparations. II. Oxidation of Carbinols.** Henning Lund. *Acta Chemica Scandinavica*, v. 11, no. 3, 1957, p. 491-498.

An anodic voltammetric investigation of 30 carbinols with a vibrating Pt electrode in acetonitrile containing $NaClO_4$ is carried out. The electrode reaction corresponding to the first wave of anisyl alcohol is shown by controlled potential electrolysis to be an oxidation of anisyl alcohol to anisaldehyde.

14619* (German.) Action of the Square Impulse and Sinus Current on the Diffusion Current of Mercury Ions on a Quiet Mercury Electrode. **Wirkung des Viereckimpulses und des Sinusstroms auf den Diffusionsstrom der Quecksilberionen an ruhender Quecksilberelektrode.** J. Dévay. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 9, nos. 1-4, 1956, p. 135-143.

The depolarization due to the diffusion of Hg ions, of an electrode placed in a one N solution of KCl containing Hg ions, proved to be greater when polarization was attained by asymmetric square impulse and an asymmetric sinus current than that obtained by polarization with d.c.

14620* (German.) An Improved Polarographic Cell With a Streaming Mercury Electrode. **Eine verbesserte polarographische Zelle mit strömender Quecksilberelektrode.** K. Győrbíró and L. Poós. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 9, nos. 1-4, 1956, p. 185-189.

A streaming Hg electrode of new design was evolved which seems to be suited better for oscillographic, and particularly for common polarographic measurements, than any other type applied so far.

14621* (German.) Polarographic Investigation of the Organic Metal Complexes of Quinalizarin. **Polarographische Untersuchung von organischen Metallkomplexen des Chinalizarins.** E. Bodor. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 9, nos. 1-4, 1956, p. 375-380.

In a strongly alkaline medium no effect of Al ions on the quinalizarin wave was observed. Calcium and Zn ions, in turn, decreased the intensity of the diffusion current in proportion to the concentration of metal ions.

14622 Equations for the Limiting Current at the Rotated Dropping Mercury Electrode. Yutaka Okinaka and I. M. Kolthoff. *American Chemical Society, Journal*, v. 79, July 5, 1957, p. 3326-3339.

Results of a theoretical and experimental study of the relationship between the limiting current at the rotated dropping Hg electrode on the one hand and the diffusion coefficient of the electroactive species, the kinematic viscosity of the solution, and the characteristics of the electrode, on the other.

14623* (English.) **Estimation of Tungstate Ion by Tensammetry.** B. Breyer and S. Hacobian. *Analytica Chimica Acta*, v. 16, May 1957, p. 497-500.

14624* (German.) The Question of Anode Shape in Industrial Electrolysis. **Zur Frage der Anodenformen bei Technischen Elektrolysen.** G. Jangg and H. Hohn. *Chemiker-Zeitung*, v. 81, June 20, 1957, p. 397-400.

Use of a complicated anode offers no significant saving of energy input over simple perforated plates, but appreciable saving can be attained with stronger anode polarization.

14625* (Russian.) Effect of Radiation on the Electrochemical Activity of Zirconium. **Ob izmenenii elektrokhimicheskoi aktivnosti tsirkoniia pod deistviem izlucheniia.** I. L. Rozenfel'd and E. K. Oshe. *Doklady Akademii Nauk SSSR*, v. 114, May 1, 1957, p. 143-145.

Variation with time of the current strength of Zr-Al and Zr-Fe couples in 3% NaCl.

14626 Electrochemical Affinity. Sutdies in Electrochemical Thermodynamics and Kinetics. Pierre Van Rysselberghe. 109 p. 1955. Hermann & Cie, Editeurs, Paris. (QD501 V35e)

Theory of galvanic and electrolytic cells; theory of electrodes; reversible electrodes; polarization; overpotentials; electrochemical kinetics; thermoelectrochemistry.

14627 N-Halogen Organic Compounds as Cathode Materials for Primary Batteries. C. K. Morehouse and R. Glicksman. *Electrochemical Society, Journal*, v. 104, Aug. 1957, p. 467-473.

Of the compounds studied, cyclic ureides and melamine derivatives have the most promising characteristics for use as cathode materials. Electrodes composed of these materials operate during current flow at potentials approximating the halogen-halide couple, and give in an $AlCl_3$ electrolyte ampere-minute per gram capacities corresponding to a two-electron change per "positive" halogen in the molecule.

14628 Annealing Anodic Ta_2O_5 Films. Changes in Dissolution Behavior and X-Ray Scattering. D. A. Vermilyea. *Electrochemical Society, Journal*, v. 104, Aug. 1957, p. 485-488.

Upon annealing, the rate of solution of the film in HF decreases and the X-ray diffraction pattern from the film becomes sharper.

14629 A Study of Cathode Potentials in Aqueous Tungstate Solutions. D. R. Markwell and M. L. Holt. *Electrochemical Society, Journal*, v. 104, Aug. 1957, p. 488-493.

14630 Electrolytic Reduction of Nitrobenzene to Hydrazobenzene. Kiichiro Sugino and Taro Sekine. *Electrochemical Society, Journal*, v. 104, Aug. 1957, p. 497-504.

14631 The Equilibrium Between Titanium Metal, $TiCl_2$, and $TiCl_3$ in NaCl-KCl Melts. Warren C. Kreye and Herbert H. Kellogg. *Electrochemical Society, Journal*, v. 104, Aug. 1957, p. 504-508.

At 700 to 780 C divalent Ti is the predominant species.

14632 Preparation of Pure Fused Lithium Chloride-Potassium Chloride Eutectic Solvent. H. A. Laitinen, W. S. Ferguson, and R. A. Osteryoung. *Electrochemical Society, Journal*, v. 104, Aug. 1957, p. 516-520.

Method involves drying a eutectic mixture of LiCl-KCl under moderate vacuum, fusion under anhydrous HCl and removal of the HCl from the melt.

14633 New Horizons for Battery Power. Arnold E. Look, Jr. *Electronic Industries & Tele-Tech*, v. 16, July 1957, p. 34 + 5 pages.

Requirements of air-borne and under-water missiles and their effect on battery development.

14634 New Grids Improve Lead-Acid Cells. Howard J. Strauss. *Electronic Industries & Tele-Tech*, v. 16, July 1957, p. 39 + 1 page.

Alloy grids provide a choice of properties for different applications.

14635* (Czech.) Electrolytic Production of High Purity Chromium. **Elektrolytická výroba vysoce čistého chromu.** Jan Kaloč and Vladimír Dlouhý. *Hutnické Listy*, v. 12, June 1957, p. 509-516.

High-purity Cr can be prepared by electrolysis of aqueous solutions of trivalent and hexavalent Cr salts. Influence of bath composition, concentration, and temperature and current density; relation between the surfaces of electrodes, and their distances, material, shape, preparation, and arrangement.

14636 Recovery of Uranium From Fused Salt Melts by Electrodeposition. L. W. Niedrach and G. R. Fountain. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission)*, KAPL-1693, Mar. 1957, 18 p. (UF767 Un3.1Ka Contin.)

An electrolytic method is described for recovering U values from waste salts from an electrorefining process for reactor fuels. The behavior of U and representative active metal fission-product elements in such a process is described.

14637 Electroplating Is an Important Step in the Construction of a Man-Made Satellite. George W. Grupp. *Metal Finishing*, v. 55, July 1957, p. 40-44.

Procedures followed in the Au plating surface treatment of the satellite for Project Vanguard.

14638 Racks for Anodizing. J. E. Bunch. *Metal Finishing*, v. 55, July 1957, p. 45-49.

Problems and design factors encountered in producing a suitable device to hold material for anodizing.

14639 What Size Filter? Gunnar Gabrielson. *Metal Finishing*, v. 55, July 1957, p. 50-51.

Quantitative aspects of the continuous filtering of electroplating solutions.

14640 Science for Electroplaters. XXVI. Waste Disposal. L. Serota. *Metal Finishing*, v. 55, July 1957, p. 58-60.

Methods of recovering valuable materials and treatment of the residue of industrial wastes.

14641* (Russian.) Surface Hardening of Low Alloy Steels by Means of a Boron Treatment. **Poverkhnostnoe borirovanie nizkolegirovannykh stalei.** V. D. Taran and L. P. Skugorova. *Metallovedenie i Obrabotka Metallov*, no. 6, June 1957, p. 43-47 + 2 plates.

Structure and properties of B coatings electrolytically deposited on some low alloy structural steels. Brittleness in relation to temperature and time.

14642 Art Metal's Automatic Aluminum Anodizing Set-Up. *Metal Products Manufacturing*, v. 14, July 1957, p. 26-27.

Automated system provides finer quality with little maintenance and higher production rate for furniture maker.

14643* (French.) Effect of Certain Factors on the Electrolytic Precipitation of Cobalt. **Influence de certains facteurs sur la précipitation électrolytique du cobalt.** Jean Nokin. *Revue Universelle des Mines*, v. 13, ser. 9, June 1957, p. 220-232.

Difficulties of obtaining Co by electrolysis and determining the best methods of production. An analysis of the effect of pH, concentration, temperature, and certain impurities.

14644* (English.) **Studies on Electrolytic Titanium From Fused Salts.** Kenji Ono, Tomoo Matsushima, Kyoshû Hata, and Tsunakichi Kuriyama. *Science Reports of the Research Institutes, Tôhoku University*, ser. A, v. 9, June 1957, p. 227-238.

Presents phase diagrams of some electrolytes of binary or ternary fused salts chiefly composed of K_2TiF_6. The solubility of TiO_2 in these salts was determined. The mechanism of electrolysis was studied by the measurement of the decomposition voltage of TiO_2 in fused salt, and the result was discussed by thermodynamic study.

14645 Polarographic Theory. I. The Influence of Non-Uniform Mercury Flow and Intermittent Polarization on the Diffusion Current. G. C. Barker. *U. S. Atomic Energy Research Establishment*, A.E.R.C. C/R 1553, 1957, 13 p. (UF767 G79.1a Contin.)

Approximate expressions are derived for the concentration gradient in the solution at the surface of a drop electrode whose surface area is a function of the time when the drop is polarized for the whole or part of its life.

14646* (Russian.) The Electrochemical Behavior of Titanium in Aqueous Solutions of Electrolytes. **Eletrokhimicheskoe povedenie titana v vodnykh rastvorakh elektrolitov. I.** Hydrogen Overpotential on Titanium. **Perenapriazhenie vodoroda na titane.** Ia. M. Kolotyrkin and P. S. Petrov. *Zhurnal Fizicheskoi Khimii*, v. 31, Mar. 1957, p. 659-672.

14647* (Russian.) Effect of Electrolysis Conditions and Electrolyte Composition on the Porosity of Nickel Deposits. **Vliianie uslovii elektroliza i sostava elektrolita na poristost' gal'vanicheskikh nikelevykh pokrytii.** A. L. Rotinian, N. P. Fedot'ev, E. E. Mishchenkova, and Dë Du-kho. *Zhurnal Prikladnoi Khimii*, v. 30, May 1957, p. 716-723.

Optimum electrolyte composition and electrolysis parameters for securing deposits with minimum porosity and high corrosion resistance.

See also: **14214** (manufacturing control of alkaline batteries); **14309** (polarography of glucosazones); **14991** (surface rule of corrosion).

ELECTRONICS

14648 The Condenser Microphone as a Displacement Detector Calibrator. Walter Koidan. *Acoustical Society of America, Journal*, v. 29, July 1957, p. 813-816.

The absolute calibration of a variable capacitance type displacement detector was performed by using the diaphragm of a condenser microphone as a reference moving surface. Measured values of the displacement detector response are plotted from 10 c.p.s. to 40,000 c.p.s.

14649* A Survey of the Nuclear Radiation Effects on Semiconductor Materials and Devices. Bernard Reich and G. Edward Pavlik. *A. G. E. T. News Bulletin*, v. 1, July 1957, p. 8-17.

14650* Failure Analysis and "Ball-Park" Estimates of Equipment Reliability Based on the Number of Electron Tubes in the Equipment. Larry D. Smith. *A. G. E. T. News Bulletin*, v. 1, July 1957, p. 17-29.

14651* (French.) A Contribution to the Study of Semiconductor Structures With a Negative Dynamic Resistance and of the Oscillations They Are Able to Sustain. **Contribution a l'étude des structures semiconductrices présentant des résistances dynamiques négatives et des oscillations qu'elles peuvent entretenir.** A. Leblond. *Annales de Radioeléctricité*, v. 12, Apr. 1957, p. 95-139.

Study of a semi-conducting device whose voltage-current characteristic has a negative slope over a certain range of current values.

14652* (German.) Measurement of Transmission Distortions in Frequency-Modulated Radio Instruments. **Messung von Übertragungsverzerrungen an Richtfunkgeräten mit Frequenzmodulation.** Helmut Hartbaum. *Archiv der Elektrischen Übertragung*, v. 11, June 1957, p. 239-252.

A method by which distortions can be determined separately by static and dynamic nonlinearities. It can be applied to individual elements of radio links such as modulators, and demodulators, and the distortion of complete systems can also be measured.

14653* (Russian.) Conversion of β-Particle Energy Into Electric Energy in Crystals of Germanium With *P-N* Junctions. **O preobrazovanii energii β-chastits v elektroenergiiu v kristallakh germaniia s *P-N*-perekhodami.** B. M. Bul, V. S. Vavilov, L. S. Smirnov, G. N. Galkin, V. M. Patskevich, and A. V. Spitsyn. *Atomnaia Energiia*, v. 2, June 1957, p. 533-537.

Studies of recombination of electrons and holes in the recombination levels of structural defects produced during bombardment.

14654 The RC Crossover Compromise. Norman H. Crowhurst. *Audio*, v. 41, July 1957, p. 17 + 5 pages.

Advantages and disadvantages of the high-impedance crossover network.

14655* Novel Systems Will Cool Electronics at Mach 3 Plus. C. F. Johnson. *Aviation Age*, v. 28, July 1957, p. 124-127.

Cryogenic systems are now being considered for most Mach 3 plus applications. Two of the most promising and technically advanced methods involve vortex tube cooling and thermoelectric cooling.

14656 A Versatile Source of Millimeter Waves. C. F. Hempstead and A. R. Strnad. *Bell Laboratories Record*, v. 35, July 1957, p. 241-245.

The latest versions of the backward-wave oscillator deliver 5 to 10 milliwatts of power between 45,000 and 57,000 mc., and oscillation has been achieved at 200,000 mc.

14657* Detection of Pulse Signals in Noise. The Effect on Visual Detection of the Area of the Signal Paint. J. W. R. Griffiths. *British Institution of Radio Engineers, Journal*, v. 17, June 1957, p. 330-338.

The improvement in detection of a signal in noise obtained by trace-to-trace correlation can be largely accounted for by the increase in the solid angle subtended at the eye by the signal "paint".

14658 The Impedance of the Oxide-Coated Cathode at Ultra-High Frequencies. L. J. Herbst. *British Journal of Applied Physics*, v. 8, July 1957, p. 277-282.

Impedance was measured on a number of disk seal triodes at frequencies ranging from 500 to 2365 Mc. per sec. Mean values of the parallel elements R and C_2 which constitute the coating impedance were 15Ω (σ=0.29Ω $^{-1}$ m^{-1}) and 6.5 pF (ϵ=3.2) respectively. The value of R decreased with increasing temperature.

14659* (French.) Current of Minority Carriers Through Metal-Germanium Contact Rectifiers. **Sur le courant de porteurs minoritaires à travers les contacts redresseurs métal-germanium.** Guy Mesnard and Alexandre Dolce. *Comptes Rendus*, v. 245, July 1, 1957, p. 42-44.

Calculation of the current of minority carriers as a function of the voltage used, by computing the varying lifetimes and surface recombination velocities.

14660* (Russian.) The Influence of Electric Field on the Properties of Thin Dielectric and Semiconductor Layers. **Vlianie elektricheskogo polia na svoistva tonkikh dielektricheskikh i poluprovodnikovykh sloev.** *Doklady Akademii Nauk SSSR*, v. 113, Apr. 11, 1957, p. 1023-1024.

14661 Problems in Protection of Radar Receivers. G. D. Speake. *Electronic Engineering*, v. 29, July 1957, p. 313-317.

The protection of a radio receiver from damage caused either by the associated system transmitter or from external sources is discussed.

14662 A Very Low Frequency Three-Phase Oscillator. M. D. Armitage. *Electronic Engineering*, v. 29, July 1957, p. 318-323.

Cathode feedback circuit increases the time-constant of the resistance-capacitance networks in a phase-shift oscillator. Complete oscillator for the frequency range 0.01 to 40 c/sec. uses only five valves.

14663 An Improved Circuit for Reliable Operation of Nomotron Counter Tubes. T. M. Jackson. *Electronic Engineering*, v. 29, July 1957, p. 324-326.

Details of new operating conditions which extend the range of application and greatly enhance tube reliability and performance.

14664 A Rapid Response Hear-Rate Meter. D. G. Wyatt. *Electronic Engineering*, v. 29, July 1957, p. 336-337.

Instrument is suitable for measuring the rate of incidence of equally spaced pulses, covers the range 10 p/min. to 500 p/min.

14665 A Modified Periodmeter. V. Narayana Rao and K. Achyuthan. *Electronic Engineering*, v. 29, July 1957, p. 338-339.

An instrument for observing small changes in the frequency of an audio signal of short duration.

14666 Designing Transistor Circuits—Tuned Amplifiers. I. Richard B. Hurley. *Electronic Equipment*, v. 5, July 1957, p. 14-17.

Details of simple transformer and its equivalent circuit, also several transistor circuits.

14667 Pulse Applications of a Diffused-Meltback Silicon Transistor. Richard A. Stasior. *Electronic Equipment*, v. 5, July 1957, p. 18-21.

Transistor characteristics of main concern to a circuit designer indicate a high alpha-cut-off frequency and a high current gain, along with moderate voltage ratings.

14668 Design Features of a Transistor Sweep Circuit. Joseph Chernof. *Electronic Equipment*, v. 5, July 1957, p. 22-23.

Discussion of a sweep waveform generating circuit.

14669 Radiation Effects on Electronic Components. P. S. Miglicco. *Electronic Equipment*, v. 5, July 1957, p. 26-31.

Exposure in a radiation environment influences the reliability of electronic systems. Effects on crystal diodes, capacitors, resistors, gas filled tubes, thermistors, high voltage batteries, the Ektron cell, and photomultipliers were analyzed.

14670 Design for an Improved High-Frequency Transistor. C. Thornton, J. Roschen, and T. Miles. *Electronic Industries & Tele-Tech*, v. 16, July 1957, p. 47 + 3 pages.

The L-6100 surface alloy transistor utilizes a thinner base width and smaller diameter electrodes.

14671 Improving the Glow Transfer Tube. T. M. Jackson. *Electronic Industries & Tele-Tech*, v. 16, July 1957, p. 50 + 2 pages.

By careful design, tubes and circuits which will step reliably after 1000 hrs. continuous conduction on one cathode were made.

14672 Hot Junctions and Collector Cut-Off Current. Bernard Reich. *Electronic Industries & Tele-Tech*, v. 16, July 1957, p. 55-56.

The data show that the only temperature sensitive parameter is the saturation component.

14673* D. F. Aerial System for Decimetre Wavelengths. C. Clarke. *Electronic & Radio Engineer*, v. 34, July 1957, p. 238-245.

Two aerials, each combined with a flat-sheet reflector, are mounted above a circular earth-plane and oriented approximately at right angles. Cone monopoles are used for vertical polarization and flat, circular-disc dipoles for the horizontal system.

14674* Power Spectrum of a Carrier Modulated in Phase or Frequency by White Noise. R. Hamer. *Electronic & Radio Engineer*, v. 34, July 1957, p. 246-253.

Measurement of the power spectrum of a carrier, modulated either in phase or in frequency by a uniform Gaussian noise signal. Results are interpreted in the light of existing theory. A combination of measured and theoretical results is used to prepare generalized curves of f.m. and ph.m. noise spectra.

14675* Transistors in High-Frequency Amplifiers. W. Guggenbühl and M. J. O. Strutt. *Electronic & Radio Engineer*, v. 34, July 1957, p. 258-267.

Properties of transistors and their behavior in amplifier stages in the H. F. region. Data on noise behavior design of input stages.

14676 Core Tester Simplifies Ferro-Amplifier Design. R. W. Roberts and C. C. Horstman. *Electronics*, v. 30, Aug. 1, 1957, p. 150-153.

Procedure using results obtained from dynamic tests made on core material prior to winding simplifies magnetic amplifier design by proper interpretation of standard test values of circuit constants. Normalized design equations for the most common magnetic amplifiers are given and their application to specific design problems discussed.

14677 Video Scanner Matches Photo Patterns. E. J. Oelbermann. *Electronics*, v. 30, Aug. 1, 1957, p. 154-155.

System under development for determining differences in two photos taken from same point in space at different times produces a standard width line at each point of contrast change as scanner passes over pattern. Applications include aerial surveys and study of microscopic growth.

14678 Platinotron Increases Search Radar Range. William C. Brown. *Electronics*, v. 30, Aug. 1, 1957, p. 164-168.

A new type of crossed-field microwave tube resembles magnetron but has no resonant circuit. Operating frequency is determined externally, either as broadband amplifier or fre-

quency-stabilized self-excited oscillator giving over 60% efficiency at an output of 2 megawatts. Radar beam can be scanned without mechanically moving reflector or radar can be shifted rapidly to new frequency to avoid R.F. interference or enemy jamming signals.

14679 Measuring Parameters of Junction Transistors. Roy W. Hendrick, Jr. *Electronics*, v. 30, Aug. 1, 1957, p. 174-176.

Instrument measures dynamic ground-emitter characteristics of *pnp* or *npn* transistors at any static collector current from 0.15 to 15 ma. Integral transistor stage reduces effective impedance of test meter to approximate short circuit in β measurement.

14680 The Effect of Nuclear Radiation on Selected Semiconductor Devices. G. L. Keister and H. V. Stewart. *I.R.E., Proceedings*, v. 45, July 1957, p. 931-937.

Samples of both Ge and Si devices were exposed.

14681 Very Narrow Base Diode. R. H. Rediker and D. E. Sawyer. *I.R.E., Proceedings*, v. 45, July 1957, p. 944-953.

Techniques were developed to fabricate semiconductor diodes with rectifying junction to ohmic contact distances of the order of microns.

14682 Back Scattering From Water and Land at Centimeter and Millimeter Wavelengths. C. R. Grant and B. S. Yaplee. *I.R.E., Proceedings*, v. 45, July 1957, p. 976-982.

14683 IRE Standards on Electron Tubes: Definitions of Terms, 1957. *I.R.E., Proceedings*, v. 45, July 1957, p. 983-1010.

14684 Design of Unsymmetrical Band-Pass Filters. Richard F. Baum. *Institute of Radio Engineers, Transactions on Circuit Theory*, v. CT-4, June 1957, p. 33-40. (TK1 In6.6c Vis.)

Basic ideas and their application to a few classical synthesis procedures.

14685 Analysis and Synthesis of Delay Line Periodic Filters. Harry Urkowitz. *Institute of Radio Engineers, Transactions on Circuit Theory*, v. CT-4, June 1957, p. 41-53. (TK1 In6.6c Vis.)

14686 A Modified Equal-Element Band-Pass Filter. R. Bawer and G. Kefalas. *Institute of Radio Engineers, Transactions on Microwave Theory and Techniques*, v. MTT-5, July 1957, p. 175-176. (TK1 In6.6mt Vis.)

By increasing the loaded Q of the center resonant element of a five-stage, equal-element filter, the pass-band ripple can be appreciably reduced and the skirt selectivity improved.

14687 Application of Rayleigh-Ritz Method to Dielectric Steps in Waveguides. R. E. Collin and R. M. Vaillancourt. *Institute of Radio Engineers, Transactions on Microwave Theory and Techniques*, v. MTT-5, July 1957, p. 177-184. (TK1 In6.6mt Vis.)

Use of the method to obtain approximations to the first N eigenfunctions in a partially filled guide permits straightforward evaluation of the junction discontinuity existing between an empty and partially filled guide.

14688 Coupling Through an Aperture Containing an Anisotropic Ferrite. Donald C. Stinson. *Institute of Radio Engineers, Transactions on Microwave Theory and Techniques*, v. MTT-5, July 1957, p. 184-191. (TK1 In6.6mt Vis.)

Coupling is investigated theoretically by a simple extension of Bethe's small-hole coupling theory to include the dipole moment of the body in the aperture.

14689 An Adjustable Sliding Termination for Rectangular Waveguide. Robert W. Beatty. *Institute of Radio Engineers, Transactions on Microwave Theory and Techniques*, v. MTT-5, July 1957, p. 192-193. (TK1 In6.6mt Vis.)

The termination is of simple design and can easily be adjusted to have reflection coefficients from zero to nearly unity in magnitude and any desired phase.

14690 A Method of Producing Broad-Band Circular Polarization Employing an Anisotropic Dielectric. H. S. Kirschbaum and S. Chen. *Institute of Radio Engineers, Transactions on Microwave Theory and Techniques*, v. MTT-5, July 1957, p. 199-203. (TK1 In6.6mt Vis.)

14691 Excess Noise in Microwave Crystal Diodes Used as Rectifiers and Harmonic Generators. J. M. Richardson and J. J. Faris. *Institute of Radio Engineers, Transactions on Microwave Theory and Techniques*, v. MTT-5, July 1957, p. 208-212. (TK1 In6.6mt Vis.)

Observations for 1N26 crystals, used as detectors, doublers, and triplers, and excited by X-band power in the range 8 to 100 mw. are presented, showing limitations on spectral purity set by the process of noise production during harmonic generation.

14692* A Survey of the Theory and Applications of Ferrites at Microwave Frequencies. P. J. B. Clarricoats, A. G. Hayes, and A. F. Harvey. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, Suppl. 6, 1957, p. 267-282.

The general physical properties of ferrites are outlined briefly, together with several mechanisms to account for the dispersion which occurs in their R.F. permeability.

14693* Some Properties of Circular Waveguides Containing Ferrites. P. J. B. Clarricoats. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, Suppl. 6, 1957, p. 286-295.

The propagation behavior of circular waveguides containing longitudinally magnetized ferrite rods.

14694* Non-Reciprocal Network Theory Applied to Ferrite Microwave Devices. H. J. Carlin. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, Suppl. 6, 1957, p. 316-319.

Brief discussions of network concepts which have been useful in reciprocal network structures, and arise primarily from the properties of the scattering matrix, are extended to certain linear non-reciprocal structures represented by microwave devices.

14695 Structure and Characteristics of Silicon Carbide Light-Emitting Junctions. Lyle Patrick. *Journal of Applied Physics*, v. 8, July 1957, p. 765-776.

Current-voltage characteristics of SiC *p-n* junctions were measured on light-emitting samples prepared in such a way as to minimize leakage at the periphery and through "blue spots."

14696* A Low-Noise Transistorized Seismic Preamplifier. I. S. Sacks. *Journal of Geophysical Research*, v. 62, June 1957, p. 267-278.

Dependence of noise on operating conditions of the transistor. Details of preamplifier with noise low enough for use down to ground displacements of 10^{-9} cm. with seismometers whose output is 5 ω volts per cm.

14697 Printed Circuitry. III. Design Factors. Allan Lytel. *Military Automation*, v. 1, May-June 1957, p. 142-149.

Consideration of base material, size and width of conductors, type of conductors, and cost of fabrication in circuit design.

14698 Cosmic-Ray Effects and Transistors. A. H. Drayner. *Military Electronics*, v. 3, July 1957, p. 24-27.

Investigation of the affects of radiation in upper atmosphere on the performance of telemetering and other electronic equipment.

14699* (English.) **Electron-Electron Interaction and Superconductivity. I.** Ziro Mikura. *Physical Society of Japan, Journal*, v. 12, June 1957, p. 587-610.

An electron gas exhibits the Meissner-Ochsenfeld effect if a special type of electron-electron interaction is assumed and if the motion of an electron is considered to obey Dirac's relativistic equation.

14700* (English.) **Effect of Inelastic Waves on Electron Diffraction.** Hide Yoshioka. *Physical Society of Japan, Journal*, v. 12, June 1957, p. 618-628.

Inelastic scattering gives rise to an additional complex term to Fourier coefficients of the inner potential. This potential is derived from a quantum mechanical basis and its numerical value estimated.

14701 Power System Communications. E. Openshaw Taylor, editor. 304 p. 1957. George Newnes Ltd., London. (TK 5101 T21p)

A series of lectures devoted to communication circuits and apparatus, radio and television equipment, carrier-current equipment, supervisory control, telemetering, and intertripping in Great Britain.

14702 Modular Electronic Units. John Alden. *Product Engineering*, v. 28, July 1957, p. 164-168.

Electronic equipment mechanically designed around a series of standard building-block elements simplifies design and production and provides maximum utility and reliability.

14703 6 - Transistor Amplifier - Modulator Delivers 10 Watts. Bill Hamlin. *Radio-Electronics*, v. 28, Aug. 1957, p. 47-49.

A transistor modulator to provide crisp, clear, low-distortion audio output when used with both fixed and mobile rigs.

14704 Audio Frequency Sweep Generator. Richard Graham. *Radio & Television News*, v. 58, Aug. 1957, p. 63 + 3 pages.

Sweeps from 0 to 20,000 c.p.s. Useful in producing display of audio frequency response on scope screen.

14705 Amazing Surface Barrier Transistor. Edwin Bohr. *Radio & Television News*, v. 58, Aug. 1957, p. 70 + 2 pages.

The high spots of the SBT, its theory, history of development, and some practical applications and circuits.

14706 RCA Victor Television Service Clinic. The 700 Series Color Television Receivers. Technical Features—Set-Up—Servicing. 87 p. 1956. RCA Service Co., Camden, N. J. (TK6670 R21s)

Practical information for the television service technician.

14707 Semiconductor Abstracts. E. Paskell, editor. v. III. 322 p. 1957. John Wiley & Sons, New York. (ZTK3376 B32a Ref.)

Abstracts of the 1955 literature on semiconducting and luminescent materials and their applications. Includes statements of important results.

14708* Single-Sidebands in Communication Systems. A Bibliography. Mildred Benton, compiler. Pt. I. 99 p. 1956. Naval Research Laboratory, Washington, D. C. (ZTK6553 B44s Ref.)

The unclassified literature on the subject, including periodical articles, books, and research reports covering the period 1921-1956.

14709* Transistor Application in Aeronautical Equipment. Franklin W. Campbell. *Sperry Engineering Review*, v. 10, May-June 1957, p. 14-18.

Problems in conversion to transistorized versions.

14710 Transistor Circuit Engineering. Richard F. Shea, editor. 468 p. 1957. John Wiley & Sons, New York. (QC544.T3 Sh31tr)

Basic transistor theory with examples of proper application in typical circuits.

14711 Government Electronics Research. *U. S. Department of Commerce, Office of Technical Services*, PB Report 121779, Jan.-Dec. 1956, 50 p. (ZQC701 Un3.7g Ref.)

14712 Testing Techniques Used in the Quality Selection of RCA 6810 Multiplier Phototubes. Frederick A. Kirsten. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3430(Rev.), Oct. 1956, 18 p. (UF767 U3u Contin.)

14713* (German.) X-Ray Conductivity of Amorphous Selenium Layers. **Röntgenleitfähigkeit amorpher Selen-Schichten.** R. Eppe. *Zeitschrift für Angewandte Physik*, v. 9, June 1957, p. 261-268.

Amorphous Se resistance cells with consistent electrical and photoelectrical qualities were produced. Variation of dark and X-ray conductivity through addition of foreign atoms. Estimation of electrical conductivity and effective and absolute quantum yield from constant and alternating light measurements.

14714* (Russian.) Effect of Fast Neutron Irradiation on Recombination of Electrons and Holes in Germanium Crystals. **Vliianie oblucheniia bystrymi neitronami na rekombinatsiiu elektronov i dyrok v kristallakh germaniia.** V. S. Vavilov, A. V. Spitsyn, L. S. Smirnov, and M. V. Chukichev. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, v. 32, Apr. 1957, p. 702-705.

Irradiation of Ge crystals with fast neutrons increases the rate of volume recombination. The strong effect of neutron radiation on the lifetime of the carriers can be used to record and measure integral fast neutron fluxes.

14715* (Russian.) Dependence of Emission Power of a p-n-Junction on Its Structure and Operating Conditions. **Zavisimost' emissionnoi sposobnosti p-n-perekhoda ot ego struktury i uslovii raboty.** K. B. Tolpygo. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, May 1957, p. 884-898.

14716* (Russian.) Rise of E. M. F. in Amorphous Selenium Under X-Radiation. **Vozniknovenie elektrodvizhushchikh sil v amorfnom selene pod deistviem rentgenovskogo izlucheniia.** F. I. Kolomoitsev and F. F. Kodzhespirov. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, May 1957, p. 899-904.

Dependence of e. m. f. in amorphous Se on radiation time, temperature, and intensity of X-rays.

14717* (Russian.) Interaction of Impurity Center Electrons With Acoustic Vibrations in Crystals. **Vzaimodeistvie elektrona primesnogo tsentra s akusticheskimi kolebaniiami odnoosnogo kristalla.** L. I. Korovin. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, May 1957, p. 905-913.

The steady state of the electron-acoustic vibration system of the crystal lattice of an uniaxial atomic semiconductor was analyzed in an adiabatic approximation. The tensor character of the effective mass of electron dielectric constant of the crystal was taken into account.

See also: **14489** (photoconductive properties of AgN_3); **14493**(synthesis of phosphors and photoconductors); **14569** (charactron shaped beam tube); **14696** (transistorized preamplifier); **14810** (cosmic radio noise); **14811** (propagation of V.H.F. waves); **14949** (alloying on Ge surfaces); **15096** (properties of Ge); **15176** (microsectioning of semiconductors); **15380** (electron trap depths).

ENGINEERING ECONOMICS

14718 The Commercialization of Research Results. *American Management Association, Special Report No.* 20, 1957, 99 p. (HD28 Am35s Vis.)

Executives with experience in all phases of long-range planning and research management discuss the various aspects of a successful development program.

14719 Our Expanding Economy. Clyde Williams. *Analysts Journal*, v. 13, June 1957, p. 80-83.

Technology and research represent one of the primary reasons for the current strength in our economic growth pattern and the tremendous advance and diversification of industry. The scientists and engineers produced by our colleges have made possible the rapid growth of research and have helped management make use of these advancements. Our technology-based economy distributes its benefits to all of the people. The growth pattern of a product is related to research, population growth, and gross national product. Forward steps on the technological front will be supplemented by important social and political actions that will give impetus to economic progress.

14720 Automation and Technological Change. 644 p. 1955. Available from Superintendent of Documents, Government Printing Office, Washington, D. C. (TA165 Un3.24a)

Hearings before the Subcommittee on Economic Stabilization of the Joint Committee on the Economic Report, of the Eighty-Fourth Congress of the U. S. A study of the impact of automation on long-run employment and investment levels.

14721 Quarterly Report on Current Prices. *Chemical and Engineering News*, v. 35, July 8, 1957, p. 53-76.

Prices of chemicals, pharmaceuticals, resins, waxes, oils, pigments, surface active agents, and detergents are reported. A sales record of $25 billion is expected in the chemical industry this yr.

14722* Weighing the Success of New Product Ideas. C. Wilson Randle. *Industrial Marketing*, v. 42, July 1957, p. 37-40.

Effective new product selection, development, and introduction is now the key both to company growth and survival.

14723* (French.) Low Alloy Steel Development in France and Abroad. **De l'évolution des aciers de traitement faiblement alliés en France et a l'étranger.** Georges Delbart and André Michel. *Institut de Recherches de la Sidérurgie, Publications*, ser. B, no. 33, May 1957, 28 p. (*Reprinted from Mémoires de la Société des Ingénieurs Civils de France*, no. 117, Jan.-Feb. 1957, p. 22-49.) (TN602 In7p Vis.)

A historical survey of low alloy steel production before and after 1945, in France and other countries, with suggestions towards economical applications.

14724* (German.) Scientific Method of Analysis and Forecast for Energy Consumption. **Wissenschaftliche Methoden für Analyse und Prognose in der Energiewirtschaft.** Herbert Mueller. *IVA Tidskrift för Teknisk-Vetenskaplig Forskning*, v. 28, no. 4, 1957, p. 191-195.

14725 Marketing Research in the Petroleum Industry. 176 p. 1957. American Petroleum Institute, New York. (HD 9560 Am35.5m)

A survey of the marketing research organizations, policies, and practices of major oil companies.

14726 Monthly Index of Conditions Affecting Water Supply. Paul Kaser. *Ohio Department of Natural Resources, Division of Water*, June 1957, 7 p. (GB1025 Oh3a Contin.)

Hydrologic data for June from various observation stations throughout Ohio.

14727 Readings in Market Research. 235 p. 1956. The British Market Research Bureau Ltd., London. (HF5415 B77r)

A selection of papers by British authors on various aspects of the post-war development of market research in Great Britain.

See also: **14069** (Finnish fertilizer industry); **14571** (costs of analog computers); **14808** (coal producers in Indiana); **14964** (world Sn industry); **15251** (future of nuclear power).

FLUID MECHANICS

14728 Mass Flowmeter for In-Flight Refueling. C. F. Taylor. *ASME, Transactions*, v. 79, July 1957, p. 1039-1042.

This flowmeter incorporates very large capacity in a compact rugged unit of unusually high accuracy. Other features are lightweight, low pressure drop, no rotating fluid seals, and fast response to sudden changes in fuel flow rate.

14729 Noise, Vibration, and Measurement Problems, Resulting From Fluid-Flow Disturbances. R. L. Solnick and R. H. Bishop. *ASME, Transactions*, v. 79, July 1957, p. 1043-1056.

14730 Pressure Drop and Flow Characteristics of Short Capillary Tubes at Low Reynolds Numbers. Frank Kreith and Raymond Eisenstadt. *ASME, Transactions*, v. 79, July 1957, p. 1070-1078.

Pressure drop and flow characteristics were investigated experimentally for length-to-diameter ratios varying from 0.45 to 18 at diameter Reynolds numbers ranging from 8 to 1500.

14731 Turbulent Free-Convection, Heat-Transfer Rates in a Horizontal Pipe. J. P. Fraser and D. J. Oakley. *ASME, Transactions*, v. 79, July 1957, p. 1185-1191.

A generalized equation is proposed giving the ratio of heat transfer with turbulent convection to that of pure conduction in terms of the L/D ratio and Prandtl, Grashof, and Reynolds numbers.

14732* Heat-Transfer in Cylindrical Channels Involving Potential Velocity Distributions. Shiva Nandan Singh. *Chemical Engineering Science*, v. 6, no. 6, 1957, p. 283-285.

14733* On the Existence of Periodic Waves Near Critical Speed. Walter Littman. *Communications on Pure and Applied Mathematics*, v. 10, May 1957, p. 241-269.

Proof of the existence of permanent periodic waves in a channel of finite depth with a horizontal bottom.

14734* (Russian.) Propagation of a Strong Spherical Blast Wave in Gas With Heat Conduction. **O rasprostranenii sil'noi sfericheskoi vzryvnoi volny v teploprovodnom gaze.** V. P. Korobeinikov. *Doklady Akademii Nauk SSSR*, v. 113, Apr. 11, 1957, p. 1006-1009.

Mathematical analysis of movement of heat and shock waves in a perfect gas.

14735* (Russian.) On the Steady-State Temperature of a Flat Plate Placed in a Flow of Reacting Gas Mixture. **Ob ustanovivsheisia temperature ploskoi plastiny, obtekaemoi reagiruiushchei gazovoi smes'iu.** E. P. Vaulin. *Doklady Akademii Nauk SSSR*, v. 113, Apr. 21, 1957, p. 1235-1238.

Mathematical analysis.

14736 Elements of Gasdynamics. H. W. Liepmann and A. Roshko. 439 p. 1957. John Wiley & Sons, New York. (QC168 L62e)

Covers thermodynamics, basic equations of motion, fundamentals of high speed aerodynamics, experimental methods, and viscous flow.

14737* Minor Losses in Metering Nozzles. I. T. H. Redding. *Engineer*, v. 203, July 5, 1957, p. 4-7.

A comparative study of the geometry and flow-characteristics of two series of parallel-throated nozzles used for metering. The equation developed is used to evaluate probable values for the minor energy-loss factors which define the extent to which irreversible work is done by the fluid in the course of its passage through the nozzle. (To be continued.)

14738* Flow of Suspensions of Non-Cohesive Spherical Particles in Pipes. II. H. E. Rose and H. E. Barnacle. *Engineer*, v. 203, June 21, 1957, p. 939-941.

An equation for the pressure differential required to maintain steady flow is derived.

14739* Experiments on Free Convection Heat Transfer to Water in Rectangular Vertical Gaps Open at the Upper Side. B. V. Krishna Murthy and H. A. Havemann. *Indian Institute of Science, Journal*, v. 39, sec. B, Apr. 1957, p. 83-88 + 1 plate.

Rate of heat transfer decreases with gap width; for very small widths conductive heat transfer is predominant while the free convection heat transfer becomes almost negligible.

14740 Pressure Regulators for Back-Pressure, Vacuum, Flow, and Pump Discharge. III. Regulators. C. S. Beard. *Instruments and Automation*, v. 30, July 1957, p. 1293-1297.

14741* How to Select Flowmeters. Ralph Shapcott. *ISA Journal*, v. 4, July 1957, p. 272-274 + 1 plate.

Several types are described and their properties tabulated.

14742 Instrumentation to Measure Gas-Phase Composition of High Velocity, Two-Phase, Two-Component Flows. K. R. Wadleigh and R. A. Oman. *Jet Propulsion*, v. 27, July 1957, p. 769 + 7 pages.

Emphasizes the flow of liquid water droplets suspended in air-water vapor mixtures, with water-air mass ratios up to 0.3 and flow velocities from 350 to 600 fps.

14743 Heat Transfer to Fluids in the Region of the Critical Temperature. Walter B. Powell. *Jet Propulsion*, v. 27, July 1957, p. 776-783.

14744 Shock Hugoniot of Air. W. E. Deal. *Journal of Applied Physics*, v. 28, July 1957, p. 782-784.

Experiments are described in which an explosive-driven plate sets up a strong shock in air in contact with the plate.

14745 Particle Motions in Sheared Suspensions. V. Rigid Rods and Collision Doublets of Spheres. W. Bartok and S. G. Mason. *Journal of Colloid Science*, v. 12, June 1957, p. 243-262.

The rotations executed by rigid rods, fused doublets of equal-sized spheres, and the transitory doublets formed by collision of equal-sized spheres suspended in a liquid subjected to laminar shear, were studied by making observations along the planes of shear.

14746 Rheological Measurements of Non-Newtonian Fluids. Leonard L. Melton and Calvin D. Saunders. *Journal of Petroleum Technology*, v. 9; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 210, July 1957, p. 196-201.

Completely general method of analysis is independent of the type of viscometer employed and also the rheological type of fluid encountered except those of a thixotropic or rheopectic nature.

14747 (English.) **A Simplified Method for the Calculation of Three-Dimensional Laminar Boundary Layers.** J. A. Zaat. *Nationaal Luchtvaartlaboratorium, Rapport*, NLL-TR-F-184, Apr. 1956, 13 p. (TL526.N3 N38.5r Contin.)

The boundary layer quantities in the direction of the local free flow are calculated by neglecting the boundary layer cross flow but taking into account the three-dimensional character of the potential flow.

14748 The Thermal Instability of a Rotating Fluid Sphere Heated Within. S. Chandrasekhar. *Philosophical Magazine*, v. 2, ser. 8, July 1957, p. 845-858.

Equations governing the state of marginal instability are derived for the case when the motions and the associated perturbations have symmetry about the axis of rotation. The underlying characteristic value problem is solved for a slightly modified set of boundary conditions.

14749 The Physics of Flow Through Porous Media. Adrian E. Scheidegger. 236 p. 1957. Macmillan Co., New York. (QC 151 Sch25p)

Properties of porous media and of fluids; hydrostatics in porous media; Darcy's law and solutions based upon it; physical aspects of permeability; general flow equations; multiple phase flow.

14750* An Approach to an Analysis of the Arterial Pulse Wave. II. Fluid Oscillations in an Elastic Pipe. M. G. Taylor. *Physics in Medicine and Biology*, v. 1, Apr. 1957, p. 321-329.

Measurements were made of the frequency response characteristics of segments of different lengths, and of the apparent phase velocity of oscillations in an occluded segment.

14751* Some Aspects of Three-Dimensional Boundary Layer Flows. R. Sedney. *Quarterly of Applied Mathematics*, v. 15, July 1957, p. 113-122.

Equations are analyzed in a normal coordinate system.

14752* (French.) Quantitative Observations on Cavitation Bubbles in a Liquid Subjected to Ultrasounds and a Variable Gas Pressure. **Observations qualitatives sur les bulles de cavitation dans un liquide soumis à des ultrasons et à la pression variable d'un gaz.** Maurice Degrois. *Ricerca Scientifica*, v. 27, Mar. 1957, p. 707-720.

The variation in the height of the mean point of formation of the bubbles visible in the fluid, as well as the variations in granulometry and distribution of the bubbles are translated into a function of the gas pressure value.

14753 Laminar Flow in an Annulus With Porous Walls. A. S. Berman. *Union Carbide Nuclear Company (U. S. Atomic Energy Commission)*, K-1324, June 1957, 31 p. (UF767 Un3.1k Contin.)

Analysis of the steady-state flow of an incompressible fluid.

14754 Reflection and Refraction of Acoustic Waves by a Shock Wave. J. Brillouin. *U. S. National Advisory Committee for Aeronautics, Technical Memorandum*, 1409, July 1957, 42 p. (TL570 Un3tm)

Geometrical constructions permit determination of the kinematic characteristics of the reflected or refracted acoustic waves. The dynamic relationships show that the amplitude of the reflected wave is always less than that of the incident wave, while the amplitude of the refracted wave may in certain cases be greater.

14755 Heat Transfer in a Laminar Boundary Layer at Mach 2.5 From a Surface Having a Temperature Distribution. B. N. Pridmore-Brown. *University of Toronto, Institute of Aerophysics, UTIA Report No.* 45, Feb. 1957, 61 p. (TL570 T64.84a Vis.)

Heat transfer measurements were made on the outer surface of a hollow cylinder with a sharp leading edge at a Mach number of 2.5. The increase in boundary layer thickness due to heat transfer from the model to the flow was found to be greater than that predicted by theory.

14756* (German.) Velocity Adjustment in Wind Tunnels in the Case of Subsonic Streams. **Beitrag zur Geschwindigkeitskorrektur in Windkanälen bei kompressibler Unterschallströmung.** Georg Schmitz. *Zeitschrift für Flugwissenschaften*, v. 5, June 1957, p. 169-172.

Calculations by A. von Baranoff regarding the change of the free-stream velocity in a wind tunnel with fixed walls passing over a model are extended to the case of an open end jet wind tunnel.

14757* (Russian.) Hydrodynamics of a Solution of Two Superfluid Liquids. **Gidrodinamika rastvorov dvukh sverkhtekuchikh zhidkostei.** I. M. Khalatnikov. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, v. 32, Apr. 1957, p. 653-657.

The hydrodynamical equations for a solution of two superfluid liquids are deduced on basis of the conservation laws.

See also: **14161** (pressure drop in pipelines); **14486** (ultrasonic analysis of liquids); **14778** (behavior of thin sheets of visco-elastic fuels); **14786** (shock waves); **14823** (stratified flows); **15235** (flow of Pb-Bi eutectic); **15394** (shock waves in gases); **15473** (capillary flow).

FOOD TECHNOLOGY

14758 A Solution to the Problem of Packaging Food Products. Ignatius E. Theodorou. *Aerosol Age*, v. 2, July 1957, p. 23 + 2 pages.

Non-toxic pressurized condenser consists of an outer shell, a flexible plastic bag which carries the actives, with an inflexible dip tube inside a cartridge of propellant.

14759* (Italian.) Progress and Trends in Food Preservation and in Containers for Preserved Foods. **Progressi ed orientamenti nella conservazione degli alimenti e nei contenitori per conserve.** Rolando Cultrera. *Chimica e l'Industria*, v. 39, June 1957, p. 449-455.

Considers better utilization of raw materials and conventional applications of high and low temperatures. Particular emphasis is placed on the use of antibiotics and of ionizing radiations.

14760* (Italian.) Characteristics of Milk for Industrial Uses. **Caratteri del latte in rapporto alla sua utilizzazione industriale.** Carlo Arnaudi. *Chimica e l'Industria*, v. 39, June 1957, p. 459-469.

Reviews variations in the chemical and biological composition of milk and measures to avoid these variations.

14761 Gaging Frozen Food Temperature. D. G. Guadagni and Eugene F. Jansen. *Food Engineering*, v. 29, July 1957, p. 74 + 2 pages.

Simple, fast, accurate method of measuring temperature of cased product without destroying a carton.

14762 Effect of Copper Chelating Agents on the Pro-Oxidant Activity of Ascorbic Acid With Unsaturated Fats. George G. Kelley and Betty M. Watts. *Food Research*, v. 22, May-June 1957, p. 308-315.

A copper-ascorbic acid complex is believed to be the causative agent for the prooxidant effect of ascorbic acid in aqueous fat systems, and a hypothesis is proposed to account for the acceleration of fat rancidity by this complex.

14763* Radiation Preservation of Cured Meats. Anna Marie Erdman and Betty M. Watts. *Food Technology*, v. 11, July 1957, p. 349-353.

Commercial cured meats (ham and bologna) were radiated in air with γ-rays from a Co^{60} source. Application of sodium ascorbate in the presence of excess nitrite gave color and odor protection during radiation and brief storage periods.

14764* Pectin Hydrolysis in Certain Fruits During Alcoholic Fermentation. J. B. S. Braverman and A. Lifshitz. *Food Technology*, v. 11, July 1957, p. 356-358.

Unless the fruit in question contains pectin esterase, or the medium is contaminated by fungi, the pectin is not hydrolyzed during fermentation and no methanol is formed.

14765* Factors Affecting Quality of Prepackaged Meat. I. Physical and Organoleptic Tests. Organoleptic and Miscellaneous Physical Characteristics of Product. Warren E. Clauss, C. Olin Ball, and Elizabeth F. Stier. *Food Technology*, v. 11, July 1957, p. 363-373.

14766* The Effect of Alternate Freezing and Thawing on the Total Flora of Frozen Vegetables. G. J. Hucker and Elizabeth Russell David. *Food Technology*, v. 11, July 1957, p. 381-383.

Alternate freezing and thawing, irrespective of the original dormant count, did not increase the total flora provided growth was not initiated in the thawing phase.

14767* Microbiological Examination of Liquid Sugar Using Molecular Membrane Filters. Mary Catherine Coleman and C. R. Bender. *Food Technology*, v. 11, July 1957, p. 398-403.

Using a modified Sabourad's medium, optimum growth of yeast cells from liquid sugar occurs on membrane filters in 28 hr. at 30 C incubation temperature at pH values in the range 5.4 to 6.6.

14768 Protective Starch Matrix for Xanthophyll Oil and Vitamin A. Eileen C. Maywald and Thomas J. Schoch. *Journal of Agricultural and Food Chemistry*, v. 5, July 1957, p. 528-531.

Oxygen-sensitive materials can be protected against air oxidation by emulsifying the materials in a cooked paste of a suitable modified starch, and drying the emulsion as a thin film or flake. ***See also:*** **14057** (flavor changes due to insecticides).

FUELS AND COMBUSTION

14769 Applications of an Enthalpy-Fuel/Air Ratio Diagram to "First Law" Combustion Problems. H. N. Powell. *ASME, Transactions*, v. 79, July 1957, p. 1129-1142.

An enthalpy-fuel/air ratio diagram for equilibrium state combustion gases is formulated using absolute enthalpies.

14770* (German.) Fusion Behavior of Ashes From Hard and Brown Coals as a Function of Their Chemical Composition. **Das Fliessverhalten der Aschen von Stein- und Braunkohlen in Abhängigkeit von ihrer chemischen Zusammensetzung.** Joachim Zorn. *Brennstoff-Wärme-Kraft*, v. 9, July 1957, p. 323-325.

Coals whose ashes have very high fusion points can be made suitable for slagging furnaces by additives. Kind and quantity of the required additives can be determined from the chemical composition of the ashes.

14771* (French.) On the Carbonization of Coke. **Sur la carboxyréactivité des cokes. II.** Development of Micropores During Gasification. **Développement de la microporosité pendant la gazéification.** Marthe Bastick. *Bulletin de la Société Chimique de France*, no. 7, July 1957, p. 916-922.

Variations of reaction rate, specific surface, and porous structure of three metallurgical cokes gasified by means of CO_2. Surface area of coke has a direct effect on gasification speed.

14772 The Decomposition, Oxidation, Ignition, and Detonation of Fuel Vapors and Gases. XXXI. The Effect of Flow Configuration in an Annular Reactor of Vycor Glass on the Oxidation of Pentane. R. O. King, S. Sandler, and R. Strom. *Canadian Journal of Chemical Engineering*, v. 35, June 1957, p. 33-38.

14773* (Russian.) On Certain Laws in the Diffusion Burning of Liquids. **O nekotorykh zakonomernostiakh diffuzionnogo goreniia zhidkostei.** V. I. Blinov and G. N. Khudiakov. *Doklady Akademii Nauk SSSR*, v. 113, Apr. 11, 1957, p. 1094-1097.

Burning regularities of gasoline, kerosene, diesel fuel, and other petroleum products in vessels with different diameters.

14774 The Effect of Surface on the Slow Combustion of Methanol. K. M. Bell and C. F. H. Tipper. *Faraday Society, Transactions*, v. 53, July 1957, p. 982-990.

Slow combustion between 390 and 460 C in vessels coated with boric acid, KCl, and NaOH was investigated.

14775* (German.) The Ternary System NH_3-P_2O_5-H_2O for the Direct Transfer of Ammonia in Crude Coal Gas Into Ammonium Phosphate Compounds. **Über das ternäre System NH_3-P_2O_5-H_2O dur direkten Überführung des Ammoniaks des Steinkohlenrohgases in Ammoniumphosphatverbindungen.** Ernst Terres and Fritz Tscherter. *Gas- und Wasserfach*, v. 98, Ausgabe Gas, July 5, 1957, p. 677-682.

14776* (Russian.) High Temperature Decomposition of Heavy Liquid Fuels. **Teploty razlozheniia tiazhelykh zhidkikh topliv pri vysokikh temperaturakh.** V. T. Vdovichenko. *Gazovaia Promyshlennost'*, no. 6, June 1957, p. 11-13.

Tests show that between 700-1000 C the heat of decomposition of fuel oil fluctuates from 970 to 1200 large calories per kg. of fuel. Under identical test conditions the values for peat resin fluctuate from 870 to 1100 large calories per kg. of resin.

14777* Measurements of the Size of Droplets From Convergent-Divergent Nozzles Used in Oil Burners for Steel Furnaces. E. J. Burton and J. R. Joyce. *Institute of Fuel, Journal*, v. 30, July 1957, p. 395-398 + 1 plate.

Results show that, except at the lowest flow rate, the median size ranged from 47 to 70μ, which are comparable with those from typical steelworks burners. Gives relevant spray parameters at each flow rate.

14778* Flow and Disintegration of Thin Sheets of Visco-Elastic Fuels. N. Dombrowski, P. Eisenklam, and R. P. Fraser. *Institute of Fuel, Journal*, v. 30, July 1957, p. 399-406 + 8 plates.

Rate of vapor release depends upon the rate of development of new surface, controlled by the manner of disintegration of the fuel.

14779 Gasification of Pulverized Coal in Suspension. C. G. von Fredersdorff, E. J. Pyrcioch, and E. S. Pettyjohn. *Institute of Gas Technology Research Bulletin* 7, Jan. 1957, 71 p. (TP700 In7r Contin.)

Study of the gasification of pulverized Illinois noncoking and West Virginia low and high ash-fusion coking coals in suspension with air, oxygen, and steam mixtures, at 1.5-7.5 atm. pressure, in a pilot scale, slagging type, continuous downflow generator originally designed for processing 500 lb. coal/hr. Principal process variables investigated were the oxygen/coal and steam/coal ratios, gasification pressure, and oxygen concentration of the gasifying medium.

14780* High Intensity Combustion in Chemical Engineering. R. P. Fraser. *Institution of Chemical Engineers, Transactions*, v. 35, no. 3, 1957, p. 219-243.

Significance and advantage of burning fuels at high volumetric heat release rates. Comparative volumetric heat-release rates of industrial and other equipment. Combustion chamber design for both gaseous and liquid fuels.

14781 Measurement of Detonation Induction Distances in Combustible Gaseous Mixtures. Loren E. Bollinger. *News in Engineering at Ohio State University*, v. 29, July 1957, p. 15-22.

Equipment, methods, and experimental results for a 60% H-O mixture.

14782 Proceedings of the Anthracite Conference, October 18 and 19, 1956. *Pennsylvania State University, Mineral Industries Experiment Station Bulletin No.* 70, June 1957, 69 p. (TN21 P38b Vis.)

Nine papers on recent developments relating to the properties and utilization of anthracite.

14783 Underground Gasification. English Coal Board Takes Steps to Make It Work. *Power Engineering*, v. 61, July 1957, p. 76-77.

14784 Proceedings of the Joint Conference on Combustion. 457 p. 1955. Institution of Mechanical Engineers, London. (QD516 C76p Over.)

A collection of 43 papers dealing with developments in the mechanism of combustion and the design of related apparatus. Combustion in boilers, industrial furnaces, internal combustion engines, and gas turbines is covered.

14785 An Appraisal of Combustion Research. Ralph A. Sherman and William T. Reid. Paper from "Proceedings of the Joint Conference on Combustion". 1955. p. 7-13. Institution of Mechanical Engineers. (QD516 C76p Over.)

Research in combustion of both solid and liquid fuels is reviewed with the objective of appraising its effect on today's practice in the utilization of fuels. The relatively minor role of fundamental research in recent advances indicates that improved understanding is needed between the research worker and the engineer who must apply the results of research.

14786 (German.) Detonation and Shock-Wave. **Detonation und Stosswelle.** Michael Hansen. *Stahl und Eisen*, v. 77, June 13, 1957, p. 805-813.

Combustion, explosion and detonation. Sound velocity of gases. Blasting pressure of tubes. Pressure and temperature in the shock-wave and after its reflection. Explosions combined with shock-waves. Computation examples. Conclusions for the blast furnace and other plants.

14787 A Study of Factors Influencing the Bulk Density of Coal for Carbonisation. 44 p. 1957. British Coke Research Assn., London. (TP336 B77.7s Over.)

An interim report on research concerning the effects of moisture content, coal size, mixing, and addition of oil.

14788 Preliminary Investigation of Propane Combustion in a 3-Inch-Diameter Duct at Inlet-Air Temperatures of 1400° to 1600°F. Erwin A. Lezberg. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4028, July 1957, 19 p. (TL570 Un3t)

Ignition delays and combustion efficiencies were determined for propane injected into a heated airstream.

See also: **14233** (analysis of coal); **14857** (firing of coal for gas turbine operation).

GEOLOGY, GEOPHYSICS, MINERALOGY, AND MINING ENGINEERING

14789 (German.) Advance in Meteorological Research Since 1900. **Fortschritte in der Meteorologischen Forschung Seit 1900.** Bernard Neis. 238 p. 1956. Akademische Verlagsgesellschaft, M.B.H., Frankfurt, Germany. (QC855 N31f)

An elementary meteorology manual. After a historical survey of meteorology for the past 50 yr., the author discusses the phenomenology and aerology of the atmosphere, the weather as a transformation process of irradiated solar energy, and the practice of meteorology.

14790 (German.) Aeronautical Meteorology. **Luftfahrt-Meteorologie. v. 1.** Elementary Meteorology. **Elementare Wetterkunde.** H. Regula. 151 p. 1956. Akademische Verlagsgesellschaft, M.B.H., Frankfurt. (TL556 R26L)

Essential material for commercial pilot's license examination, including casual relationships in meteorological occurrences. Atmospheric physics: stratification, composition, humidity, altitude measurement, normal atmosphere and altimeter adjustment, stability and lability, and radiation and planetary temperature distribution. Aviation meteorology: wind, clouds, precipitation, visibility, icing, and storms. Weather reports and maps.

14791 Melting Relations of the Common Rock-Forming Oxides. J. F. Schairer. *American Ceramic Society, Journal*, v. 40, July 1957, p. 215-235.

Phase-equilibrium studies of unary, binary, ternary, quaternary, and portions of quinary systems of the common rock-forming oxides—SiO_2, Al_2O_3, FeO, Fe_2O_3, CaO, MgO, Na_2O, and K_2O.

14792 Crystal Chemistry of Hydrous Calcium Silicates. II. Characterization of Interlayer Water. George L. Kalousek and Rustum Roy. *American Ceramic Society, Journal*, v. 40, July 1957, p. 236-239.

Examination of tobermorite, 4-$5CaO \cdot 5SiO_2 \cdot 5H_2O$, and xonotlite, $5CaO \cdot 5SiO_2 \cdot H_2O$, by infra-red absorption revealed striking structural similarities and differences in the two phases.

14793* Pacific and "Mediterranean" Earthquake Mechanisms. A. R. Ritsema. *American Geophysical Union, Transactions*, v. 38, June 1957, p. 349-353.

Similarities and differences between the earthquake mechanisms of the Circum-Pacific Belt and the "Mediterranean" zone are considered and tentative conclusions are drawn about the underlying causes of earthquake-generating stress systems.

14794* Isotopic Ages of Zircon From Granites and Pegmatites. G. R. Tilton, G. L. Davis, G. W. Wetherill, and L. T. Aldrich. *American Geophysical Union, Transactions*, v. 38, June 1957, p. 360-371.

Isotopic Pb age determinations were made on 13 zircons obtained from rocks 185 to 1400 million years old.

14795* Detailed Wind Structure in an Intense Frontal Zone. Richard J. Reed. *American Meteorological Society, Bulletin*, v. 38, June 1957, p. 357-359.

Measurements taken every six sec. show that vertical wind shear is discontinuous at the frontal boundaries as anticipated from the thermal wind equation.

14796* Mines and Mineral Deposits of Mariposa County, California. Oliver E. Bowen, Jr. and Cliffton H. Gray, Jr. *California Journal of Mines and Geology*, v. 53, Jan.-Apr. 1957, p. 35-343 + 4 plates.

14797 Prospecting in Canada. A. H. Lang. 3rd Ed. *Canada, Department of Mines and Technical Surveys, Economic Geology Series No.* 7, 1956, 401 p. (QE185 C16.3p)

The foundations of geology; geology of Canada; methods of prospecting; equipment and travel; notes on specific metals and minerals; placer and small-scale lode mining; mining laws and other business matters.

14798 A Consideration of Radio Star Scintillations as Caused by Interstellar Particles Entering the Ionosphere. III. The Kind, Number, and Apparent Radiant of the Incoming Particles. G. A. Harrower. *Canadian Journal of Physics*, v. 35, July 1957, p. 792-798.

14799* Exploration in Canada. J. P. Nowlan. *Canadian Mining Journal*, v. 78, June 1957, p. 139-147.

Planning and organization of exploration program. Uses and limitations of the various air-borne and ground methods in current use.

14800* Extensive Tests Prove Value of the Air Drilling Method. A. S. Murray and Stan P. MacKay. *Drilling*, v. 18, July 1957, p. 72 + 4 pages.

14801* Some Limitations on the Possible Composition of the Ore-Forming Fluid. Paul B. Barton, Jr. *Economic Geology*, v. 52, June-July 1957, p. 333-353.

The activity ratios of various important anions in hydrothermal solutions at the time of deposition are evaluated using a simple thermodynamic technique. The ratios are interpreted in the light of the mineralogy of ore deposits and limits placed on the variability of each ratio in hydrothermal solutions.

14802* The Distribution of Lithium, Rubidium, and Caesium in Igneous and Sedimentary Rocks. E. L. Horstman. *Geochimica et Cosmochimica Acta*, v. 12, nos. 1-2, 1957, p. 1-28.

Igneous rocks have an average ratio K/Cs of 7000. The average abuandance of Cs in igneous rocks is less than 1 p.p.m.; sedimentary rocks average 4 p.p.m. Cesium reacts similarly to Rb in the geochemical cycle.

14803* The Isotopic Composition of the Ammonia and the Nitrate Ion in Rain. Thomas Hoering. *Geochimica et Cosmochimica Acta*, v. 12, nos. 1-2, 1957, p. 97-102.

The ammonia and the nitrate ions in rain-water were quantitatively isolated with the use of ion exchange resins. The N isotope ratio of each fraction was measured relative to atmospheric N.

14804 Cloud Refractive Index Studies. Robert M. Cunningham, Vernon G. Plank, and Charles F. Campen, Jr. *Geophysics Research Directorate, Geophysical Research Papers No.* 51, *Air Force Cambridge Research Center Technical Report*, AFCRC-TR-56-210, Oct. 1956, 106 p. (QC806 Un3.2g Vis.)

14805 The Granite Controversy. H. H. Read. 430 p. 1957. Interscience Publishers, New York. (PE462.G7 R22g)

A compilation of eight addresses on the origin of the granitic and associated rocks.

14806 Chemical Analyses of Illinois Limestones and Dolomites. J. E. Lamar. *Illinois State Geological Survey, Report of Investigations No.* 200, 1957, 33 p. (TN21 IL6.7r Vis.)

Tabulated data on 700 samples.

14807 Types of Late Cenozoic Gastropods in the Frank Collins Baker Collection, Illinois State Geological Survey. A. Byron Leonard. *Illinois State Geological Survey, Report of Investigations No.* 201, 1957, 23 p. + 4 plates. (TN21 IL6.7r Vis.)

14808 Directory of Coal Producers in Indiana. Charles E. Wier. *Indiana Department of Conservation, Geological Survey, Directory No.* 5, Feb. 1957, 100 p. (TN21 In2.3b Vis.)

14809* Drift Measurements of the *E*-Layer. L. Harang and K. Pedersen. *Journal of Geophysical Research*, v. 62, June 1957, p. 183-198.

The drift of the *E*-layer diffraction pattern on the ground was recorded on 2 mc. per sec. during the period of June 1953 to Sept. 1955. The time shifts between the maxima in the fading curves were recorded automatically by means of a Phillips recorder, or, optically on a three-beam oscillograph.

14810* Cosmic Radio-Noise Intensities Below 10 Mc/s. G. R. Ellis. *Journal of Geophysical Research*, v. 62, June 1957, p. 229-239.

Observations of cosmic noise at frequencies of 10.05, 5.65, 4.4, and 3.8 Mc. per sec. are reported.

14811* Diurnal Variations of Signal Level and Scattering Heights for VHF Propagation. Albert D. Wheelon. *Journal of Geophysical Research*, v. 62, June 1957, p. 255-266.

The scattering of V.H.F. radio waves in the lower ionosphere is identified with turbulent fluctuations of the electron plasma. Diurnal variations of the frequency dependence suggest a strong influence of the earth's magnetic field.

14812* The Theory of Molecular Diffusion in the Atmosphere. P. Mange. *Journal of Geophysical Research*, v. 62, June 1957, p. 279-296.

The mathematical theory of minor-constituent neutral-particle diffusion is reviewed and extended to take account of diffusion in an atmosphere with linearly varying scale height.

14813* Studies With Water and Air as Flushing Media in Rock Drilling. B. G. Fish. *Mine & Quarry Engineering*, v. 23, July 1957, p. 306-310.

Water and air are compared as flushing media in small-hole drilling. (To be concluded.)

14814 Research in Rotary-Percussive Drilling. E. P. Pfleider and W. D. Lacabanne. *Mining Engineering*, v. 9, July 1957, p. 766-772.

Fundamental and applied research in Europe and the U. S. has demonstrated that the combination of rotation and impact forces is an excellent method of drilling rocks requiring high thrusts on the drill bit. Certain advantages, including faster penetration rates, longer bit and rod life, and coarser cuttings have been indicated or proved.

14815 Apparatus and Procedure for Electromagnetic Prospecting. D. G. Brubaker. *Mining Engineering*, v. 9; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 208, July 1957, p. 777-780.

Methods and equipment for effective, speedy, and inexpensive surveys.

14816* How Low-Iron Chrysotile Asbestos is Mined and Milled in Central Arizona. D. W. Jaquays and Alvin W. Gerhardt. *Mining World*, v. 19, July 1957, p. 54-58.

14817 Fundamental Design of Gas Lift Systems. C. V. Kirkpatrick. *Petroleum Engineer (Management Ed.)*, v. 29, July 1957, p. B41 + 6 pages.

Summary of the principles that govern selection of a method of artificial lift for a given well or well systems.

14818* The Chemistry and Physics of the Atmosphere. Richard D. Cadle. *SRI, Journal*, v. 1, no. 2, 1957, p. 52-61.

Air-borne particles, their growing importance, and research being done on them; mechanism of precipitation and weather modification; air movements.

14819* (German.) Studying the Age of the World With Isotopes. **Beiträge der Isotopenforschung zur Chronologie der Welt.** F. A. Paneth. *Svensk Kemisk Tidskrift*, v. 69, no. 5, 1957, p. 257-279.

Determining the age of the earth using Pb, He, and other radioactive elements. Analytical and geological difficulties. Age determination using meteorites. Age of the chemical elements and of the world.

14820* (English.) **On the Distribution of Sea Salt Over the United States and Its Removal by Precipitation.** Chr. E. Junge and P. E. Gustafson. *Tellus*, v. 9, May 1957, p. 164-173.

Average maps for summer and winter of the distribution of chloride concentration in rain water over the U. S. are presented, and an attempt is made to explain them quantitatively.

14821* (English.) **Upper-Air Analysis Over Ocean Areas.** Bo R. Döös and Max A. Eaton. *Tellus*, v. 9, May 1957, p. 184-194.

A method of determining the mean lapse rate by interpolation is presented by means of which heights of upper pressure surfaces can be extrapolated from observed values of surface pressure and temperature.

14822* (English.) **Spectrum and Cross Spectrum Analysis of Hemispheric Westerly Index.** H. A. Panofsky and P. Wolff. *Tellus*, v. 9, May 1957, p. 195-200.

Tentative conclusions are drawn from the results of cross spectrum analysis applied to the hemispheric 500-mb. zonal index at latitudes of 25, 40 and 60° N.

14823* (English.) **On Stratified Flows in a Gravitational Field.** Chia-Shun Yih. *Tellus*, v. 9, May 1957, p. 220-228.

Potential flows with an interface in a gravitational field; equations of motion of an inhomogeneous fluid; stability of flows with continuous stratification.

14824 Petrography and Origin of Dolomite-Bearing Carbonate Rocks of Ordovician Age in Virginia. Charles Roderick Bruce Hobbs, Jr. *Virginia Polytechnic Institute, Engineering Experiment Station Series No.* 116, Mar. 1957, 128 p. (TN21 V81b Vis.)

See also: **14040** (classification of infrared landing areas); **14591** (wind-powered machines); **14726** (Ohio hydrologic data survey); **15358** (elasticity, fracture, and flow theory).

GRAPHIC ARTS

14825 Odor and Flavor Considerations in the Printing of Containers. L. C. Cartwright. *American Pressman*, v. 67, July 1957, p. 12 + 2 pages.

Considers adverse effects of the printing on odor and flavor of package contents.

14826* High Speed Electrostatic Reproduction of Print. A. I. Roshkind. *Automation Progress*, v. 2, July 1957, p. 340 + 2 pages.

A new method of copying utilizing electrostatic attraction between a powder and a charge pattern on the paper offers a fast printing device which can be developed for digital input in connection with computer outputs.

14827* How to Improve Ink Distribution. *Boxboard Containers*, v. 75, July 1957, p. 29-31.

"Reservoyer Roller" letterpress attachment improves printing quality and decreases costs of anti-offset sprays by 70%.

14828 Electronic Color Scanning and Engraving. Samuel W. Levine. *Gravure*, v. 3, July 1957, p. 12 + 6 pages.

A review of the activities of all known companies working on the development of electronic color scanners and electronic engravers for the graphic arts field. (To be concluded.)

14829 Why Gravure Rollers Sometimes Fail. E. B. Davis. *Gravure*, v. 3, July 1957, p. 16 + 3 pages.

The smallest diameter, thinnest wall, hardest synthetic rubber, and least pressure for impression rollers will give the maximum efficiency.

14830 Crack Pattern in Chromium Plate, and Wear of Gravure Cylinders. James M. Dugan. *Gravure*, v. 3, July 1957, p. 18-19.

The presence of cracks constitutes a problem in the wear of gravure cylinders. Several steps may be taken to reduce the possibility of such wear, but all of these have some disadvantage in the gravure operation.

14831 Technique for Preparing Lantern Slides. J. A. Southern. *Journal of Chemical Education*, v. 34, July 1957, p. 324.

Suggests use of photographic negatives from chalk-board diagrams.

14832* The Nature of Photographic Sensitivity. J. W. Mitchell. *Journal of Photographic Science*, v. 5, May-June 1957, p. 49-70.

Concludes that the principal function of the Ag_2S sensitivity center is to trap positive holes and thus to prevent the regression of latent image specks. The theory of dye sensitization has been extended and a number of new features introduced.

14833* The Future of Rotary Letterpress Printing. George Card. *Managing Printer*, v. 42, July 1957, p. 16 + 2 pages.

14834* Photo-Line and Screen-Line. Two Aids to Lithographic Artists. Mildred Weiler. *Moden Lithography*, v. 25, July 1957, p. 27 + 2 pages.

Cites applications of these two processes.

14835* 3-Color Direct Separation. V. Proving and Printing. John M. Lupo, Jr. *Modern Lithography*, v. 25, July 1957, p. 30 + 5 pages + 1 plate.

14836* Lithographer Describes Use of Watercote for Proofing Color Jobs. Bernard Gasser. *Modern Lithography*, v. 25, July 1957, p. 41-42.

Provides color proof prior to the production run.

14837* The Magenta Contact Screen. John Pince. *National Lithographer*, v. 64, July 1957, p. 14 + 1 page.

Some pointers for best results.

14838* Lighting for Color Control in the Graphic Arts. Warren B. Reese. *Pacific Printer, Publisher and Lithographer*, v. 96, June 1957, p. 11 + 7 pages.

Work being done to establish a color standard for illumination is described.

14839 How to Take Power Plant Photographs. Terry Mitchell. *Power Engineering*, v. 61, July 1957, p. 70-72.

Some tips on photographing machinery.

14840* Properties and Processing of Presensitized Offset Printing Plates. II. Light Variables and Development. Axel Lundbye. *Printing Equipment Engineer*, v. 87, July 1957, p. 43-46.

(To be continued.)

14841* Anamorphic Lens System. Seymour Rosin. *Society of Motion Picture and Television Engineers, Journal*, v. 66, July 1957, p. 407-409.

Optical design of "Scanoscope", showing how aberrations are controlled over a field angle of 80° or more. Unique coupling arrangement allow lens to be used interchangeably with camera lenses of different focal lengths in a unit focus arrangement.

14842* A New Automatic Iris Control for Motion-Picture Cameras. Mervin W. LaRue, Jr. *Society of Motion Picture and Television Engineers, Journal*, v. 66, July 1957, p. 413-416.

Mechanical power to drive the lens iris originates from a small d.c., permanent-magnet motor driven by Hg batteries. A photovoltaic cell deflects a relay meter according to average scene brightness, and opening or closing the motor-battery circuit causes the lens iris to be properly positioned.

See also: **15416** (surface treatment of polyethylene for printing); **15557** (photography in map making); **15563** (design of trademarks).

HEAT POWER

14843 Diesel and Gas-Engine Advances, 1954. *American Society of Mechanical Engineers, Oil and Gas Power Division, Proceedings*, v. 26, June 1954, sections individually paged. (TN863 Oi5p Vis.)

A collection of papers dealing with cooling towers, trends in compressor design, speed governing specifications, turbocharging two-stroke cycle engines, gas turbines, and diesel plant design.

14844 Predicting Performance of Large Steam Turbine-Generator Units for Central Stations. H. Hegetschweiler and R. L. Bartlett. *ASME, Transactions*, v. 79, July 1957, p. 1085-1114.

Efficiency-calculation method can be used to compare equipment of various sizes and types.

14845 An Analytic Procedure for Optimizing the Selection of Power-Plant Components. W. A. Wilson. *ASME, Transactions*, v. 79, July 1957, p. 1120-1128.

Gives systematic procedures for optimizing the selection of equipment, and by analytical techniques narrows the range in which detailed explorations are required.

14846* Coolant Gas Circuit and Steam Raising Plant. R. H. Bird. *Atomics & Nuclear Energy*, v. 8, July 1957, p. 245-250.

Some of the problems involved in ensuring maximum efficiency at some stages between nuclear reactor output and power generation.

14847* Some Metallurgical Aspects of a Gas Turbine Engine. S. Heslop. *Birmingham Metallurgical Society, Journal*, v. 37, June 1957, p. 497-523 + 1 plate.

Discussion of the components of a gas turbine engine for automotive use.

14848* (Russian.) A Study of Ignition by Hot Surfaces in an Engine. **Issledovanie vosplameneniia nagretoi poverkhnost'iu v usloviiakh dvigatelia.** A. N. Voinov. *Doklady Akademii Nauk SSSR*, v. 113, Apr. 21, 1957, p. 1259-1262.

Investigation of surface temperature at which ignition can take place, studied in a wide range of temperatures and pressures.

14849* (Russian.) Kinetic Relations in the Case of Hot-Surface Ignition Within an Engine. **Kineticheskie zavisimosti pri vosplamenenii nagretoi poverkhnost'iu v usloviiakh dvigatelia.** A. N. Voinov. *Doklady Akademii Nauk SSSR*, v. 114, May 1, 1957, p. 135-138.

Dependence of ignition on temperature and pressure was determined for a series of typical fuels.

14850* (German.) Determination of the Efficiency of the Turbines of Low Pressure Hydroelectric Generating Stations by Means of Flow and Output Measurements. **Ermittlung der abgegebenen Turbinenleistung bei Durchfluss- und Wirkungsgradmessungen in Niederdruck - Wasserkraftwerken.** E. Petter. *Elektrotechnik und Maschinenbau*, v. 74, July 1, 1957, p. 286-293.

Electrical measurements of flow and output. Symbols and instruments. Actual measurements and interpretations.

14851* Discharge From an Engine Cylinder to Atmosphere. I-II. R. S. Benson. *Engineer*, v. 203, June 21, 1957, p. 946-949; June 28, 1957, p. 976-978.

The discharge of gas from a cylinder to atmosphere in a running engine with variable cylinder length and both outflow and inflow through piston-controlled exhaust ports is analyzed by the method of characteristics. Mode of discharge is by wave action which persists even after the discharge process is completed.

14852* A Good Investment—Supercharging Horizontal Engines in the Field. C. S. Kenworthy. *Gas Age*, v. 119, July 11, 1957, p. 42 + 6 pages.

Experience of 1 to 3 yr. indicates substantial saving in first and operating costs.

14853* (German.) How to Determine Ignition Speed of Gases, in Which $z > 100$ Cm. Sec.$^{-1}$, Using the Dommer Device. **Bestimmung der Zündgeschwindigkeit von Gasen, bei denen $z > 100$ cm s^{-1} ist, bei Benutzung des Dommer-Gerätes.** Karl-Heinz Schmidt. *Gas- und Wasserfach*, v. 98, Ausgabe Gas, July 5, 1957, p. 683-686.

Dommer apparatus is inaccurate in determining high speeds of flame propagation. A new scale is developed permitting high ignition speeds to be read directly and correctly.

14854 Gas-Side Wall Temperatures in Rib-Backed Liquid-Cooled Combustion Chambers. J. G. Bartas. *Jet Propulsion*, v. 27, July 1957, p. 784-786.

Concerned with "hot-spot" on the wall of a rocket combustion chamber.

14855 Treat Your Cooling Water Right. R. G. Dalbke and J. M. Masterson. *Power Engineering*, v. 61, July 1957, p. 56-59.

Treatment of water to control scale formation, corrosion, biological growths, and wood deterioration.

14856 Philo Set Records in 1925—Does It Again in 1957. Chester R. Earle. *Power Engineering*, v. 61, July 1957, p. 60 + 3 pages.

Performance of the new supercritical generator is described.

14857 Coal Firing for the Open-Cycle Gas Turbine: A Comparison of Methods. Herbert R. Hazard. Paper from "Proceedings of the Joint Conference on Combustion". 1955. p. 340-346. Institution of Mechanical Engineers. (QD516 C76p Over.)

The economical and operational considerations on which choice of a firing method must be based depend largely on control characteristics of the turbine and firing equipment, dust loading of the gas supplied to the turbine, cycle losses and auxiliary power requirements, and mechanical reliability.

14858 Ford Develops the Model 519 Free-Piston Gasifier. Oscar B. Noren. *SAE Journal*, v. 65, July 1957, p. 44-48.

14859 Automotive Gas Turbine Making Strides. G. J. Huebner, Jr. *SAE Journal*, v. 65, July 1957, p. 72-75.

Today's gas turbine rivals conventional piston engines in its efficiency.

14860 Small Turbojets Suit Mach 2-3 Range at 50,000-70,000 Ft. Altitudes. Reece V. Hensley, Stanley R. Shapiro, and Raymond Capiaux. *SAE Journal*, v. 65, July 1957, p. 90-93.

An analysis of small engine design considerations.

14861 (German.) Advantages of Powering Locomotives and Ships With Free-Piston Internal Combustion Engines. **Die Vorteile des Lokomotiv- und Schiffsantriebs durch Freikolben-Verbrennungskraftmaschinen.** E. Cernea. *Technik*, v. 12, June 1957, p. 417-424.

American, British, and French versions of free-piston engines; comparison with diesel and gas turbine engines; detailed suggestions for improvement. (To be continued.)

14862* (Russian.) Determination of Coefficients for Heat Evaluation in Actual Thermal Cycle of Steam-Turbine Installation. **Opredelenie koeffitsientov tsennosti tepla dlia real'nykh teplovykh skhem paroturbinnykh ustanovok.** M. I. Shchepetil'nikov. *Teploenergetika*, v. 4, July 1957, p. 11-15.

Equations are developed. Method does not involve separate thermal calculations in determination of internal cycle efficiency.

14863* (Russian.) Laminar and Fragile Breakdowns on Models of the Rotating Turbine Discs. **Razrushenie modelei vrashchaiushchikhsia turbinnykh diskov.** M. M. Kobrin and V. P. Rabinovich. *Teploenergetika*, v. 4, July 1957, p. 16-20.

The effect of heterogeneous, unsimilar structures and stress concentrations on a disc model.

14864 Design and Experimental Evaluation of a Light-Weight Turbine-Wheel Assembly. W. C. Morgan and R. H. Kemp. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4023, June 1957, 25 p. (TL570 Un3t)

See also: **14971** (boiler corrosion control); **14972** (boiler water treatment); **15109** (life of engine parts); **15468** (steam turbines).

INFORMATION—PREPARATION AND DISSEMINATION

14865* A Detailed Biology Code for Storing, Retrieving, and Correlating Chemical-Biological Data. G. Congdon Wood. *American Documentation*, v. 8, July 1957, p. 168-180.

14866* Sorting for Chemical Groups Using Gordon-Kendall-Davison Ciphers. W. H. T. Davison and M. Gordon. *American Documentation*, v. 8, July 1957, p. 202-210.

Searching a file of chemical compounds for all those containing a particular group is facilitated by the Electronic Structural Correlator, a high-speed, sequence-controlled electronic digital computer coupled to punched card reading and sorting equipment.

14867* Use of the Coden System by the Individual Research Scientist. Charles Bishop. *American Documentation*, v. 8, July 1957, p. 221-223 + 3 plates.

A concise and unequivocal designation for journal articles will do much to facilitate handling and processing of the documents or their derivatives.

14868 (German.) Association of Technical and Scientific Libraries. Report on the 6th Session Held at Frankfurt-on-the-Main, Germany in the Battelle Institute Auditorium, March 14 and 15, 1956. **Arbeitsgemeinschaft der technisch-wissenschaftlichen Bibliotheken. Bericht uber die 6. Tagung in Frankfurt (Main) Grosses Auditorium des Battelle-Instituts am 14. und 15. März 1956.** 132 p. 1956. (Z675.T3 Ar166)

Papers deal with various phases of library technology in Germany, including construction of facilities and methods for reproduction, storage, and retrieval of information.

14869* Literary Data Processing. P. Tasman. *IBM, Journal of Research and Development*, v. 1, July 1957, p. 249-256.

A method for rapid compilation of analytical indexes and concordances of printed works, using either a conventional punched-card system or an electronic data processing machine.

14870* On Pre-Filing Sorting Methodology. Donald W. Johnson. *Library Resources & Technical Services*, v. 1, no. 2, Spring 1957, p. 109-113.

Describes a "backward" alphabetizing technique which is rapid and economical of space, and permits working with a single group of constant size rather than many constantly-subdivided groups.

14871* Methods and Procedures. G. F. Shepherd, Jr. *Library Trends*, v. 6, July 1957, p. 20-27.

Suggests practices to simplify and increase efficiency throughout the library.

14872* Interlibrary Lending and Similar Extension Services. Margaret D. Uridge. *Library Trends*, v. 6, July 1957, p. 66-86.

Problems and practices are discussed.

14873 Review of Current Machine Systems for Handling Information. Gwendolyn M. Bedford. *North Atlantic Treaty Organization, Advisory Group for Aeronautical Research and Development Report* 46, Feb. 1956, 17 p. (TL565 Ag11r Contin.)

Criteria for evaluation; marginal punched card systems; coordinate indexing; mechanized literature searching systems; electronic data processing systems.

14874 Matching of Operational Languages in Documentary Systems. R. A. Fairthorne. *North Atlantic Treaty Organization, Advisory Group for Aeronautical Research and Development Report* 49, Feb. 1956, 12 p. (TL565 Ag11r Contin.)

Clerical activities are sequences of elementary observations, identifications, and manipulations of marked objects. All clerical tasks, including marshalling and retrieval, can be studied as chains of transcriptions and transliterations.

14875 Mechanical Storage, Handling, Retrieval, and Supply of Information. Ralph R. Shaw. *North Atlantic Treaty Organization, Advisory Group for Aeronautical Research and Development Report* 50, Feb. 1956, 34 p. (TL565 Ag11r Contin.)

Technical and administrative problems involved in the storage, handling, and retrieval of library information are emphasized throughout this detailed account of the present equipment used.

14876 A Permanent Program for the Union List of Serials. 30 p. 1957. Library of Congress, Washington, D. C. (Z695.83 J66p)

An outline of the program for preparing and maintaining a comprehensive and up-to-date listing of the titles and volumes of serials held by the principal research libraries of the U. S. and Canada.

INSTRUMENTATION

14877 A Method for the Examination of Crystal Sections Using Penetrating Characteristic X Radiation. A. R. Lang. *Acta Metallurgica*, v. 5, July 1957, p. 358-364.

A series of photographs taken with stepwise translation of the crystal provides three-dimensional information on the distribution of crystal imperfections.

14878 Instrumental Methods of Color and Color-Difference Measurement. Richard S. Hunter. *American Ceramic Society, Bulletin*, v. 36, July 1957, p. 249-255.

14879 The Vernier Chronotron. H. W. Lefevre and J. T. Russell. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-49669, Apr. 1957, 28 p. (UF767 Un3.1hw Contin.)

Multichannel time difference analyzer developed for use in the mμ sec. region consists of two circulating transmission lines with a single fast coincidence circuit between them, and associated gate and scaling circuits.

14880 Instrumentation and Automation. 202 p. 1957. Available from Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. (TJ213 Un3.24i)

Hearings before the Subcommittee on Economic Stabilization of the Joint Economic Committee, of the Eighty-Fourth Congress, of the U. S. concerning the role of automation in our economy.

14881* Instruments and Their Use for the Control of Ionising Radiation in Laboratories. B. S. Smith. *Instrument Practice*, v. 2, June 1957, p. 602-606.

Permissible doses, permissible contamination levels; radiation protection monitoring; instruments for radiation measurement; air monitoring; total body gamma monitor.

14882* Instruments for Absorption Spectrophotometry. R. A. C. Isbell. *Instrument Practice*, v. 2, June 1957, p. 607-611.

14883* Instrumentation of the Chemical Plant for the Oak Ridge Homogeneous Reactor. R. K. Adams and C. S. Lisser. *ISA Journal*, v. 4, July 1957, p. 260-266.

The process described demands 2000 psi. pressure, 300 C temperature, and high corrosion rate.

14884 Development of an Apparatus for Warming Hydrogen Peroxide by Its Own Controlled Decomposition. Johann G. Tschinkel and Arlin E. Graves. *Jet Propulsion*, v. 27, July 1957, p. 796-799.

14885* (German.) Tests on the Electron Microscopic Evaluation of Reactions. **Versuche zur Ausführung elektronenmikroskopisch auswertbarer Reaktionen.** E. Wiesenberger. *Mikrochimica Acta*, nos. 3-4, 1957, p. 527-544.

Conditions were tested for the exclusive precipitability of reaction products on the carrier foil of a stage screen for the electron microscopic evaluation of reactions.

14886* (English.) **A Simple Device for Drying Precipitates.** Robert K. Maurmeyer and T. S. Ma. *Mikrochimica Acta*, nos. 3-4, 1957, p. 563-566.

A simple apparatus using a tubular quartz infrared lamp.

14887 Note on Strain Gauge Recording Equipment for the R.A.E. Intermittent Supersonic Wind Tunnels. K. G. Winter and E. J. Petherick. *North Atlantic Treaty Organization, Advisory Group for Aeronautical Research and Development Report* 64, Aug. 1956, 11 p. (TL565 Ag11r Contin.)

A simple system for photographing, up to six times per sec., revolution counters driven from strain gage balance indicators; further proposed system using punched cards. Satisfactory recording of the loads on a model over a wide incidence range can be obtained in a run of 20 sec. duration.

14888 Universal, Digital Tristimulus Integrator. W. E. White and D. L. MacAdam. *Optical Society of America, Journal*, v. 47, July 1957, p. 605-611.

An integrator with interchangeable punched-tape programs was constructed as an accessory of the General Electric recording spectrophotometer.

14889 The Magnetic Refrigerator for Temperatures Below 1°K. J. G. Daunt. *Physical Society, Proceedings*, v. 70, no. 451B, July 1957, p. 641-652.

Equipment, operations, and applications.

14890* (Russian.) Ways to Decrease the Instability of High Precision Magnetoelectric Instruments. **Puti umen'sheniia nestabil'nosti vysoko-tochnykh magnitoelektricheskikh priborov.** V. S. Mes'kin and I. S. Simkhovich. *Priborostroenie*, no. 5, May 1957, p. 8-15.

Experiments show that the instability of high precision magnetoelectric instruments depends not only on physicochemical processes which take place in permanent magnets, but also on processes occurring in the materials from which other parts of the instrument are made.

14891 Automatic Particle Counting and Sizing. B. B. Morgan. *Research*, v. 10, July 1957, p. 271-279.

Proposed methods involve automatically scanning the field with a light beam, or beams, and detecting the occurrence of particles with a photoelectric device, high speed counting circuits being used to record these occurrences. The information derived depends on the number and shapes of the scanning beams.

14892 Field Stabilizer for High-Resolution Nuclear Magnetic Resonance. H. Primas and Hs. H. Günthard. *Review of Scientific Instruments*, v. 28, July 1957, p. 510-514.

Stabilizer allows measurement of nuclear magnetic resonance signals with resolution of 10^8 under field conditions, independent of field fluctuations produced by temperature variations and stray fields.

14893 Bubble Chamber Pressure Gauge. William I. Linlor, Quentin A. Kerns, and John W. Mark. *Review of Scientific Instruments*, v. 28, July 1957, p. 535-541.

Details of mechanical gage and electrical circuit employed for measuring millisecond pressure pulses in a liquid H bubble chamber in a pulsed magnetic field region.

14894 Two Resistance-Type Hot-Pressing Furnaces for Laboratory Use. R. F. Walker and S. G. Bauer. *Review of Scientific Instruments*, v. 28, July 1957, p. 563-568.

Resistance heating is employed to obtain temperatures up to 3000 C in a graphite tube furnace, and up to 2200 C in a Mo tube furnace, both operating from the same controls.

14895* (French.) Electromagnetic Lenses. **Lentilles électroniques magnétiques.** Pierre Durandeau and Charles Fert. *Revue d'Optique*, v. 36, May 1957, p. 205-234.

General exposition of the rules of construction of electromagnetic lenses and, more particularly, lenses for the electron microscope and apparatus.

14896 Tentative Method for Determination of Particle Size Distribution of Space Insecticide Aerosols. *Soap and Chemical Specialties*, v. 30, 1957, p. 233-235.

14897 A Feasibility Study for the Design of Automatic Counting and Sizing Instrumentation. L. D. Miller. *U. S. Naval Radiological Defense Laboratory, Research and Development Technical Report*, USNRDL-TR-134, Nov. 1956, 38 p. (QC475 Un3.5r Contin.)

An instrument using an intercept length comparison method allows fast counting and sizing of irregularly shaped particles in the size range 0.5 to 3000 μ.

14898 Sources, Measurement and Control of Backstreaming in Oil Vapour Vacuum Pumps. B. D. Power and D. J. Crawley. *Vacuum*, v. 4, June 1957, p. 415-437.

14899 The Knife-Edge Vacuum Seal. G. W. Hees, W. Eaton, and J. Lech. *Vacuum*, v. 4, June 1957, p. 438-444.

Details of a reliable high-vacuum sealing technique of wide applicability and capable of containing an ultra-high vacuum. Seal can readily be assembled or dis-assembled and can withstand repeated and prolonged bake-outs as well as liquid N temperatures.

14900* (German.) Compression of Gas in Oil Diffusion Pumps. **Die Kompression des Gases in Öldiffusionspumpen.** L. Hiesinger. *Vakuum-Tecknik*, v. 6, June 1957, p. 65-70.

The theoretical basis of diffusion pumps is unclear. Principles of a new theory of operation are started.

14901* (German.) Adjustable Magnetostatic Lens Systems for Electron Microscopes. **Regelbare magnetostatische Linsensysteme für Elektronenmikroskope.** K. Müller. *Zeitschrift für Wissenschaftliche Mikroskopie und Mikroskopische Technik*, v. 63, June 1957, p. 303-328.

Basic construction; adjustment possibilities; method for judging lens arrangements; electron optical study of lens systems: 3- and 4- lens optics.

See also: **14217** (automatic titrator); **14740** (pressure regulators); **15379** (linearizing infrared spectra); **15408** (film permeameter).

LUBRICATION AND FRICTION

14902* (German.) Lubricating Properties and Applications of Graphite and Molybdenum Disulfide. **Schmiereigenschaften und technische Anwendung von Graphit und Molybdändisulfid.** Franz Lihl. *Berg- und Hüttenmännische Monatshefte der Montanistischen Hochschule in Leoben*, v. 102, May 1957, p. 149-154.

Favorable characteristics of graphite and MoS_2 to produce high quality lubricants. Structure and behavior of these lubricants under various working conditions.

14903* (Russian.) Dependence of the Coefficient of Friction on Velocity. **K voprosu o zavisimosti koeffitsienta treniia ot skorosti.** V. D. Kuznetsov and V. I. Flerov. *Doklady Akademii Nauk SSSR*, v. 113, Apr. 11, 1957, p. 1050-1052.

Effect of speed on scoring during rubbing of steel on steel and a hard alloy on steel.

14904 Measurements for the Consistency of Lubricating Grease. Ben Holliday. *Iron and Steel Engineer*, v. 34, July 1957, p. 100-105.

Types of measuring instruments. New NLGI classification of greases. Factors affecting consistency and texture.

14905* Some Effects of Gamma Radiation on Commercial Lubricants. J. G. Carroll and S. R. Calish, Jr. *Lubrication Engineering*, v. 13, July 1957, p. 388-392.

Several commercial oils and greases can be used in the presence of γ radiation for dosages of at least 10^8r. In general, the end effect of radiation on lubricants is similar to severe oxidation. Wear properties and load carrying capacity of certain oils are enhanced.

14906* Thermal Conductivity of Aircraft Engine Lubricants at Low Temperatures. V. E. Schrock and E. S. Starkman. *Lubrication Engineering*, v. 13, July 1957, p. 393-398.

The thermal conductivities and thermal diffusivities of a representative aircraft gas turbine lubricant and a representative piston engine lubricant were determined over a temperature range of -100 to $+80$ F.

14907* Transition Temperature for Surface Damage in Sliding Metallic Contact. L. F. Coffin, Jr. *Lubrication Engineering*, v. 13, July 1957, p. 399-405.

Effect of both liquid atmosphere and temperature on alloying couples, particularly Cu-Cu, Cu-Ni, and Ni-Ni under repetitive sliding. Effect of speed of sliding, load, kind of fluid, and kind of metal on the transition temperature.

14908* Grease Lubrication of Rolling Bearings. J. H. Harris. *Metalworking Production*, v. 101, July 5, 1957, p. 1157-1161.

New development based on Li 12-hydroxy-stearate. Advantages are outstanding mechanical stability, wide temperature range, long shelf-life, and resistance to drying-out and hardening in service.

14909* Storage Stability of Aircraft Greases. H. Schwenker. *Spokesman*, v. 21, July 1957, p. 10-14.

Stability is followed during exposure to simulated desert, room temperature, and simulated tropical storage conditions.

14910* (Russian.) Aluminum-Lead Bronze Bearing Metal. **Antifriktsionnaia aliuminievo-svintsovaia bronza.** E. F. Merkulov. *Tsvetnye Metally*, v. 30, June 1957, p. 67-69.

Replacement of high-lead bronzes with one containing 7-11% Sn. Successful use in tractor engines.

MECHANICAL ENGINEERING

14911* (English.) **The Limit Load Carrying Capacity of Compression Bars Made of Perfectly Plastic Materials.** E. Bölcskei. *Acta Technica Academiae Scientiarum Hungaricae*, v. 17, nos. 1-2, 1957, p. 3-23.

14912* (English.) **Theory of Highly Economical Reinforced Concrete Beams.** J. Pelikán. *Acta Technica Academiae Scientiarum Hungaricae*, v. 17, nos. 1-2, 1957, p. 39-56.

Deals with the determination of points of zero moment in continuous beams and departs from the postulate of a moment diagram of minimum area.

14913 Honeycomb-Cored Structures. A. Holt. *Aircraft Production*, v. 19, July 1957, p. 282-291.

Production problems and processes in airframe applications of Araldite resins.

14914* Air Controls Oil Circuits on a 2000-Ton Press. S. H. Durbin. *Applied Hydraulics*, v. 10, July 1957, p. 67 + 3 pages.

Directional valves are air-operated and designed with light moving parts for fast action and less effect from temperature variations.

14915 The Application of a New Structural Index to Compare Titanium Alloys With Other Materials in Airframe Structures. L. R. Jackson and S. A. Gordon. *ASME, Transactions*, v. 79, July 1957, p. 949-958.

A new structural index is compared with the results of compression tests on Al sections at room temperature, and similar tests on Ti-alloy angles and channels at room and elevated temperatures. It is believed that the new structural index will provide a reliable method of evaluating the elevated-temperature performance of materials such as Ti, in comparison with other materials, when only the compressive stress-strain curves are available at each temperature.

14916 Optimum Stresses of Structural Elements at Elevated Temperatures. Arthur Schnitt, M. A. Brull, and H. S. Wolko. *ASME, Transactions*, v. 79, July 1957, p. 959-966.

A method is developed by which optimum-stress curves for a given material at any temperature may be calculated from the room-temperature optimum-stress curves for a different material.

14917 Oronite High Temperature Hydraulic Fluids 8200 and 8515. N. W. Furby, R. L. Peeler, and R. I. Stirton. ASME, *Transactions*, v. 79, July 1957, p. 1029-1038.

Data on fluids developed for use over a wide temperature range.

14918 Effect of the Volute on Performance of a Centrifugal-Pump Impeller. R. D. Bowerman and A. J. Acosta. *ASME, Transactions*, v. 79, July 1957, p. 1057-1069.

An experimental study of volute influence on radial flow-impeller performance was conducted by operating a single impeller with three different sets of volute vanes.

14919* The Design of Knee Joints for Rigid Steel Frames. D. T. Wright. *British Welding Journal*, v. 4, June 1957, p. 265-273.

Reviews the status of the problem and proposes new formulas for the design of the common type of knee joint.

14920 On the Stress in Twisted Composite Spheres and Spheroids. Sisir Chandra Das. *Canadian Journal of Physics*, v. 35, July 1957, p. 811-817.

Stresses are calculated in the cases of concentric composite elastic spheres and spheroids when they are twisted by couples. Results are obtained in closed forms.

14921* Permissible Backlash Between Gear Teeth. W. A. Tuplin. *Engineer*, v. 203, June 21, 1957, p. 951-953.

A method of estimating the impact loading that is imposed on a pair of gears by taking up backlash under full-load torque.

14922 Shear Buckling of Simply Supported Plates Tapered in Planform. Bertram Klein. *Franklin Institute, Journal*, v. 264, July 1957, p. 43-48.

A simple, approximating set of equations is derived for calculating the shear buckling loads of isosceles trape-zoidal plates. A numerical example is worked for a typical plate.

14923 Power-Dividing Transmissions. D. L. Bedingfield. *Machine Design*, v. 29, July 25, 1957, p. 83-88.

Fundamental design details, power-flow principles, and performance characteristics of transmissions with two and three power paths for control of output speed and torque.

14924* (English.) **The Green's Function of an Elliptic Plate.** R. K. P. Singh. *Mathematika*, v. 4, June 1957, p. 61-69.

Derivation of an expression for the small transverse displacement of a thin elliptic plate due to a force applied at an arbitrary point of the plate.

14925* (English.) **Uniqueness Theorems for Thin Clamped Anisotropic Plates.** G. M. L. Gladwell. *Mathematika*, v. 4, June 1957, p. 70-75.

Problems of transfer displacements of thin anisotropic plates with the most general type of diagonal symmetry. Proofs of uniqueness of solution under certain conditions for problems of plates occupying both finite and infinite regions.

14926* (English.) **Stress Distribution in a Notched Plate.** L. A. Wigglesworth. *Mathematika*, v. 4, June 1957, p. 76-96.

Determination of the stress and displacements in a semi-infinite elastic plate which contains a thin notch perpendicular to its edge, and is in a state of plane strain or generalized plane stress under the action of given loads.

14927* Determination of Critical Speeds by "Exact" and "Approximate" Methods. G. H. Ryder. *Mechanical World and Engineering Record*, v. 137, July 1957, p. 294-297.

Simplified formulas for a variety of loading conditions and corrections for gyroscopic action.

14928* Design of Non-Circular Gears. W. H. Sheppard. *Mechanical World and Engineering Record*, v. 137, July 1957, p. 300-303.

Quick results obtained from a method of designing gears to a particular displacement function.

14929* Facts About Pump Packings and Seals. II. Packings. Harold Woodhouse. *Pipe Line Industry*, v. 7, July 1957, p. 56-59.

A guide for selection of correct packings for the fluid being pumped.

14930* Find Beam Deflections by Easy Methods. II. Charles H. Fork. *Pipe Line Industry*, v. 7, July 1957, p. 60-63.

Covers simple and cantilever beams with concentrated loads.

14931 Hydraulic Control Valves. V. Valve Circuits. John J. Pippenger. *Product Engineering*, v. 28, July 1957, p. 197-202.

Factors governing the choice of valve, its function in the circuit, and the problems that may be anticipated and avoided.

14932 Stress Concentration Factors. II. Alexander Gomza. *Product Engineering*, v. 28, July 1957, p. 215 + 4 pages.

This set of charts deals with bending stresses in T-heads and angles as well as plates.

14933* The Application of Limit Analysis to the Determination of the Strength of Butt Joints. R. T. Shield. *Quarterly of Applied Mathematics*, v. 15, July 1957, p. 139-147.

Adhesive is assumed to be an elastic-perfectly plastic material which yields when the maximum shear stress reaches a critical value.

14934* Visco-Elastic Stress Analysis. J. R. M. Radok. *Quarterly of Applied Mathematics*, v. 15, July 1957, p. 198-202.

14935* (Italian.) Measurement of Longitudinal Vibrations in the MHz Frequency Range, by Electrostatic Drive and Direction Through the Frequency Modulation Technique. **Misure di vibrazioni longitudinali nel campo di frequenza dell'ordine dei MHz, mediante eccitazione elettrostatica e rivelazione col sistema della modulazione di frequenza.** Piero Giorgio Bordoni and Mario Nuovo. *Ricerca Scientifica*, v. 27, Mar. 1957, p. 695-706.

An apparatus is described, which extends to the longitudinal vibrations of plates the electrostatic drive and F.M. detection technique formerly used to measure the natural resonant frequencies of flexural, extensional, and torsional vibrations.

14936 An Analysis of Flexural Systems Under Arbitrary Distortion and End Loading. P. J. Midgley. *Royal Aeronautical Society, Journal*, v. 61, July 1957, p. 475-484.

The effects of end loading on an arbitrarily distorted flexing beam was investigated, with particular reference to bending moment distributions along the span of the beam, and the effects of lengthwise strains.

14937 Tables of Characteristic Functions for Uniform Beams With Sliding Ends. R. E. D. Bishop. *Royal Aeronautical Society, Journal*, v. 61, July 1957, p. 494-499.

14938 Temperature Affects Engine Valve Wear. Max J. Tauschek. *SAE Journal*, v. 65, July 1957, p. 53-54.

The characteristic heat pattern and its control.

14939* (Czech.) Experimental Determination of Shearing Stress in a Twisted Bar. **Experimentální určení smykových napětí v kroucené tyči.** Klátil. *Strojírenství*, v. 7, June 1957, p. 456-461.

14940 (German.) Calculation of Durability of Machine Parts. Principles, Present Methods, and Future Possibilities. **Berechnung von Maschinenteilen auf Dauerhaltbarkeit. Grundlagen, gegenwärtiger Stand und zukünftige Möglichkeiten.** W. Euchler. *Technik*, v. 12, June 1957, p. 425-431.

Process of and factors affecting fatigue fracture. Effect of size, design, and surface condition. (To be continued.)

14941 Theory of Land Locomotion. The Mechanics of Vehicle Mobility. M. G. Bekker. 520 p. 1956. University of Michigan Press, Ann Arbor. (TL145 B39t)

A comprehensive source of information on the physical relationship between a motor vehicle and the environment of its operation, particularly in off-the-road locomotion. Includes problems of snow and soil mechanics; crawlers of track-laying vehicles; skis, sleds, toboggans, rigid wheels, and pneumatic tires; scale-model testing and dimensional theory.

14942* (German.) The Buckling Problem of Orthotropic Plates With Hollow Supports. **Das Beulproblem der orthotropen Platte mit Hohlsteifen.** Alf Pflüger. *Zeitschrift für Flugwissenschaften*, v. 5, June 1957, p. 178-181.

Considers buckling of rectangular orthotropic plates under compression, with the anisotropy generated by a panel of constant thickness carrying a series of stiffeners of closed hollow section. The torsional rigidity thus generated has a considerable influence on the value of the buckling stress.

See also: **14546** (hydraulic servo system); **15081** (fatigue strength of shafts); **15144** (production of gears); **15269** (pumps for reactors); **15270** (reactor pumps); **15412** (fatigue of reinforced plastics); **15414** (structural plastics); **15415** (photoelastic stress analysis); **15421** (hydraulic systems); **15453** (creep of visco-elastic materials); **15492** (synthetic fiber felts); **15509** (properties of honeycomb cores).

METALLURGY

14943* (German.) On the Scientific Bases of the Production of Metallic Tungsten for the Electrical Lamp Industry and

of the Influencing of Its Qualities. **Über die naturwissenschaftlichen Grundlagen der Erzeugung von metallischem Wolfram für die Vakuumtechnik und die Beeinflussung seiner Eigenschaften.** T. Millner. *Acta Technica Academiae Scientarum Hungaricae*, v. 17, nos. 1-2, 1957, p. 67-112.

Manufacturing experiences and research results gathered over several decades. Properties of metallic W with reference to the lamp industry.

14944* (German and French.) Aluminum Foil Properties. **Eigenschaften der Aluminiumfolie.** E. Amann. *Aluminium Suisse*, v. 7, May 1957, p. 86-91.

A classification of Al foils on the basis of the thickness of the rolled products, their uses, and other technical qualities such as thickness tolerance, freedom from pores, gloss and dullness, and absence of chemical reactions.

14945* (German.) Development and Application of High-Pressure Steels. **Entwicklung und Anwendung der Hochdruckstähle.** I. Class. *Chemie-Ingenieur-Technik*, v. 29, June 1957, p. 372-386.

Properties of steels for chemical high-pressure construction, including hydrogen-resistant low- and high-alloyed steels. Application of these steels under operating conditions in various chemical processes.

14946 Design Data for Welded Steel Tubing. *Design News*, v. 12, July 1, 1957, p. 120-123.

Tolerances and specifications.

14947 How to Select Chrome-Moly Steels for Ball and Rod Mill Liners. T. E. Norman. *Engineering and Mining Journal*, v. 158, July 1957, p. 102-106.

The properties, fields of application, and comparative wear resistance of "Chrome-Moly" liner steels.

14948* (French.) Chromium and Ferrochromium in Special-Steel Preparation. **Le chrome et le ferro-chrome dans l'elaboration des aciers speciaux.** M. Dingeon. *Journal du Four Electrique*, v. 62, May-June 1957, p. 87-91.

Principal sources of Cr ore. Requirements and methods for refractories, dichromates, and ferroalloys. Preparation of Cr metal by reduction with C or Si.

14949 Some Aspects of Alloying Onto Germanium Surfaces. J. W. Peterson, J. McGlasson, Jr., and W. C. Hittinger. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and* Metallurgical Engineers, Transactions, v. 209, July 1957, p. 823-827.

Layers of *n*-type with thickness in the range of 0.0002-in. over areas of 0.006-sq. in. were produced on intrinsic Ge wafers by an alloy regrowth process as one stage in the fabrication of transistors. Satisfactory alloying requires proper choice of solvent and doping impurity, good wetting of solvent to Ge, avoidance of contamination, good orientation of the Ge surface to the (111) plane, proper temperature cycle, and an inverted temperature distribution in the melt. Details are given of the process now in use in which Pb is the solvent and Sb the doping impurity.

14950 Liquid Metals Technology. I. F. J. Van Antwerpen, editor. 84 p. 1957. American Institute of Chemical Engineers, New York. (TA459 Am34.4L)

Ten papers concerning the processing of liquid metals, their properties, and use in reactor systems.

14951 17-4 PH Castings. David C. Ekey and Erroll V. Black. *Materials in Design Engineering*, v. 46, July 1957, p. 105-107.

A combination of high strength, corrosion resistance, and simple heat treatment make this stainless steel a valuable material for aircraft and other specialized applications.

14952 Magnesium and Its Alloys. M. W. Mote and R. J. Jackson. *Materials in Design Engineering*, v. 46, July 1957, p. 115-134.

An up to date manual on the properties, fabrication, and uses of the Mg alloys now commercially available.

14953* (French.) Molybdenum. Its Mining. Its Metallurgy. **Le molybdène: son extraction, sa métallurgie.** R. E. Warriner. *Métallurgie et la Construction Mécanique*, v. 89, June 1957, p. 539 + 4 pages.

Historical and geographical considerations. Description of the operation of the Climax Mine (Colorado). Conversion and processing of ore. Consumption and use of Mo and its alloys in the chemical industry.

14954* (French.) The Choice of Gear Steels and Their Heat Treatment. **Le choix des aciers pour engrenages et leurs traitements thermiques.** O. Patterman. *Métallurgie et la Construction Mécanique*, v. 89, June 1957, p. 549 + 7 pages.

Importance of the heating time and soaking of gear steels', processing diagrams; machinability; surface finish according to heat treatment; influence of the micrographic structure on machining output with carbide tools; flame tempering. (To be continued.)

14955 Titanium Tubing. Thomas M. Krebs. *Metal Progress*, v. 72, July 1957, p. 82-87.

Seamless tubing is available in a wide range of sizes in A-40, A-55, or A-70 grades with extruded and ground or machined surfaces or cold finished. Welded and cold finished tubing is also available. Alloy tubing may be obtained in the extruded and heat treated condition. Its outstanding resistance to chemicals indicates a large future use in the chemical and process industries.

14956 Criteria for Evaluating Electrical Resistance Alloys. C. Dean Starr. *Metal Progress*, v. 72, July 1957, p. 88-94.

Although the "life" of Ni-Cr and Ni-Cr-Fe resistors has been increased tenfold in the past 30 yr., industry is still improving the older standardized analyses, and seeking new varieties of Ni-Cr-Al, Fe-Cr-Al, and Mo base alloys for more severe services.

14957 Choosing Alloys for Die Casting. W. Wolf. *Metal Treatment and Drop Forging*, v. 24, July 1957, p. 272-276.

Compositions, casting characteristics, and mechanical properties of Sn, Pb, Zn, Al, Cu, and Mg alloys.

14958* Titanium Extrusions. A. M. Sabroff and P. D. Frost. *Modern Metals*, v. 13, July 1957, p. 52 + 5 pages.

Summarizes available information concerning heat-treatment, die design, extrusion practice, post-extrusion processing, and mechanical properties.

14959 (German.) Forgeable Aluminum Alloys. **Aluminium-Knetlegierungen.** Ernst Kocherhans. *Schweizer Archiv für Angewandte Wissenschaft und Technik*, v. 23, June 1957, p. 174-178.

Historical survey of developments in malleable Al alloys during the past 50 yr.; classification according to their essential properties such as electric conductivity and heat and corrosion resistances. Principal uses.

14960 Stainless Steel. A Review of Its Advantages and Uses. P. M. Slater. *Sheet Metal Industries*, v. 34, July 1957, p. 503-516.

Advantages of stainless steel in some new fields, with special reference to those depending on the use of cold-rolled sheet and strip.

14961 (German.) Effect of the Nitrogen Linkage by Aluminum on the Properties of High-Strength Structural Steels. **Einfluss der Stickstoffabbindung durch Aluminium auf die Eigenschaften von Baustählen.** Hans-Joachim Weister, Walter Bading, Helmut Riedel, and Werner Scholz. *Stahl und Eisen*, v. 77, June 13, 1957, p. 773-784.

Equilibrium ratios between Al, N, and AlN in the melt and in the solid state of steels containing 0.16 to 0.2% C, 0.3 to 0.6% Si, and 1.3 to 1.8% Mn. Effect of finely divided inclusions of AlN on grain size, mechanical properties, and notch toughness. Testing the weldability and hot hardness.

14962 (German.) Deoxidation and Technological Characteristics of Killed Basic Converter Steels. **Desoxydation und technologische Eigenschaften beruhigter Thomasstähle. II.** Contents of Inclusions, Degree of Purity, and Characteristics of Killed Basic Converter Steels. **Einschlussgehalte, Reinheitsgrad, und mechanische und technologische Eigenschaften beruhigter Thomasstähle.** Erwin Plöckinger and Rupert Rosegger. *Stahl und Eisen*, v. 77, June 13, 1957, p. 798-804.

14963 The Utilization of Tungsten for High Purity Applications. Russell C. Nelson. *Sylvania Technologist*, v. 10, July 1957, p. 78-83.

The effects of various impurities designated in tungsten-concentrate purchase specifications are discussed from the standpoint of their effect on wire for use in incandescent lamps and on process control of metal powder for use in the carbide industry. A review of the effect of gases and other processing contaminants of lamp filaments is also included.

14964 Survey of Tin. Georges Péter, et al. *Times Review of Industry*, v. 11, new ser., July 1957, p. 53 + 9 pages.

Nine papers on the world tin industry including production, properties, uses, research, alloys, organotin compounds, and marketing.

14965* (Polish.) Using Spheroidal Iron Instead of Alloys of Non-Ferrous Metals and Cast Steel. **Stosujmy żeliwo sferoidalne zamiast stopów metali nieżelaznych i staliwa.** Jerzy Adamczyk. *Wiadomości Hutnicze*, v. 13, May 1957, p. 142-145.

Mechanical and technical properties of spheroidal iron. Resistance to corrosion and high temperatures. Applications to welding and plating with other metals, and to plastic treatment between 840 and 1050 C.

14966 Stainless Spring Wire. John Francis Trant. *Wire and Wire Products*, v. 32, July 1957, p. 761 + 4 pages.

Data on characteristics of the commonly used grades which will enable users to select the proper grades and to understand the manner in which the characteristics of these steels affect their design and performance.

14967* (Russian.) Obtaining High-Purity Amorphous Boron. **Poluchenie amorfnogo bora vysokoi chistoty. I.** Reduction of Boron Anhydride by Light Metals. **Vosstanovlenie bornogo angidrida legkimi metallami.** V. I. Mikheeva, F. I. Shamrai, and E. Ia. Krylova. **II.** Physico-Chemical Analysis of the Reaction of Mg With Boron Anhydride. **Fiziko-khimicheskii analiz reaktsii magniia s bornym angidridom.** V. I. Mikheeva, V. Iu. Markina, and O. N. Kriukova. **III.** Refining of Amorphous Boron. **Rafinirovanie amorfnogo bora. IV.** The Problem of Determining the Quality of Amorphous Boron. **K. Vopro su ob otsenke kachestva amorfnogo bora.** V. I. Mikheeva, F. I. Shamrai, and E. Ia. Krylova. *Zhurnal Neorganicheskoi Khimii*, v. 2, June 1957, p. 1223-1253.

See also: **14160** (ceramic reinforced alloys); **14544** (computer for steel mill design control); **14723** (low alloy steels); **14847** (metallurgy of gas turbine engine); **15536** (metallurgy of welding stainless alloys).

METALS—CORROSION

14968 The Reaction of Metals With Water and Oxidizing Gases at High Temperatures. H. M. Higgins and R. D. Schultz. *Aerojet General Corporation (U. S. Atomic Energy Commission)*, IDO-28000, Apr. 1957, 56 p. + 58 plates. (UF767 Un3.1id Contin.)

14969 Corrosion Evaluation of Binary Uranium Alloys in Water at 100 C. H. A. Saller, H. A. Pray, R. F. Dickerson, W. E. Berry, and E. L. Foster, Jr. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-971, Dec. 1954, 37 p. (UF767 U3b Contin.)

Additions ranging from 2 to 12 at.% of some 42 elements and effect of heat treatment on corrosion resistance were investigated. Melting characteristics, fabrication temperatures, and heat-treatment temperatures for each alloy were noted.

14970* (German.) Corrosion Studies. **Korrosionsstudium. X.** Mechanism of Reaction in Corrosion of Metals in Moist Sulfur Dioxide Atmospheres. **Reaktionsmechanismus der atmosphärischen Metallkorrosion in feuchter mit Schwefeldioxyd verunreinigter Umgebung.** K. Bartoň and E. Beránek. **XI.** Effect of Light on the Atmospheric Corrosion of Zinc and Iron in a Pure Atmosphere. **Einfluss der Belichtung auf die atmosphärische Korrosion von Zink und Eisen in reinen Atmosphären.** E. Beránek, K. Bartoň, K. Smrček, and I. Sekerka. *Collection of Czechoslovak Chemical Communications*, v. 22, Apr. 1957, p. 356-378.

14971* (French.) Anticorrosive Protection in Industrial Plants Producing and Using Steam. **La protection contre la corrosion des installations industrielles de production et d'utilisation de vapeur.** R. Malicet. *Corrosion et Anticorrosion*, v. 5, June 1957, p. 174-184.

Various types of corrosion in tubing, boilers, and superheaters. Anticorrosive measures. (To be continued.)

14972 Prevention of Corrosion by Water Treatment. T. B. Fielden. *Corrosion Technology*, v. 4, July 1957, p. 225-229.

Boiler corrosion and its prevention.

14973* (English.) **Tropical Corrosion.** K. S. Rajagopalan. *Electrochemical Society, Bulletin of India Section*, v. 6, Apr. 1957, p. 29 + 4 pages.

Effect of tropical atmospheric conditions on various metals; protective treatments.

14974 The Corrosion of Single Crystals and Recrystallized Single Crystals of Iron and Steel in Citric Acid. W. Roger Buck and Henry Leidheiser, Jr. *Electrochemical Society, Journal*, v. 104, Aug. 1957, p. 474-481.

Corrosion studies, largely in 0.2M citric acid at 20 C and at the boiling point, were made on polycrystalline disks and monocrystalline spheres and disks of Armco iron and type L steel. Preliminary experiments indicated that the (100) face corroded at the slowest rate and the minor faces, of which the (321) is an example, corroded at the most rapid rate. Quantitative measurements were confined to these two crystal faces. The (100) face was cathodic to the (321) face as shown by potential measurements in 0.2M citric acid in the presence and absence of air. The rate of corrosion of the (321) face was approximately twice that of the (100) face on specimens which were chemically and electrolytically polished, machined with a sharp lathe tool, or polished with emery paper. The rates of corrosion of the polycrystalline starting material from which the single crystals were prepared were several times greater than those of the single crystals. Conversion of the single crystals to polycrystalline material by heating through the transformation temperature resulted in a considerably increased corrosion rate. In the presence of 40-45 p.p.m. of Sn (II) the rates of corrosion of the single crystals in 0.2M citric acid at the boiling point were reduced greatly and no significant difference between the (100) and (321) faces was observed.

14975 The Formation of Films on Aluminium Immersed in Water. R. K. Hart. *Faraday Society, Transactions*, v. 53, July 1957, p. 1020-1027 + 2 plates.

Below a critical temperature, between 60 and 70 C, film growth proceeds in three stages: "amorphous" boehmite, γ-AlO(OH); and bayerite, $Al_2O_3.3H_2O$, the final film thus consisting of three layers.

14976* (Polish.) Influence of Mechanical Surface Treatment of Metals and Alloys on Their Resistance to Corrosion. **Wpływ rodzaju obróbki powierzchni metali i stopów na ich odporność na korozję.** Stanisław Mrowec and Teodor Werber. *Hutnik*, v. 24, Apr. 1957, p. 142-147.

Reviews theories on corrosion of metals. Attempts to connect corrosion of surfaces of metals with their external treatment and finishing operations.

14977 Fractionation of Oxygen Isotopes in the Formation of Oxide Films on Copper. John B. Brown, Malcolm Dole, and G. A. Lane. *Journal of Chemical Physics*, v. 27, July 1957, p. 251-258.

Measurements at 0, 25, and 100 C on granular Cu and Cu foil by determining the O^{18}/O^{16} isotope ratio in the residual unreacted O gas after a fraction of the O has reacted.

14978* (German.) Zinc Surfaces After Various Preparative Treatments. **Die Oberfläche von Zink nach verschiedenartiger Vorbehandlung.** K. Huber and D. Laske. *Metalloberfläche*, v. 11, July 1957, p. 217-225.

Surface layers resulting from air, water, or aqueous solutions are composed almost entirely of ZnO, show very different but reproducible structures depending on the corroding material.

14979* (Italian.) On Corrosion of Metals at High Temperatures From Vanadium Dioxide. **Sulla corrosione dei metalli ad alta temperatura da parte dell'anidride vanadica. III.** Effect of Al and Si on the Corrosion Resistance of Ni-Cr Steels. **Effetto di alluminio e silicio sulla resistenza alla corrosione**

di acciai al nichel-cromo. V. Cirilli and A. Burdese. *Metallurgia Italiana*, v. 49, May 1957, p. 320-326.

14980* (Italian.) On Some Inhibitors of Aluminum Corrosion. **Su alcuni inibitori della corrosione dell'alluminio. I. Ambiente acido in présenza di acido tannico o di colofonia.** G. De Angelis and V. Carunchio. *Metallurgia Italiana*, v. 49, May 1957, p. 349-354.

Results obtained by employing tannic acid and a variety of colophony (rosin) as inhibitors of Al corrosion in HCl.

14981* (Italian.) Theoretical Considerations and Practical References on the Oxidability of Metals and Alloys in the Melted Condition. **Considerazioni teoriche e reiferimenti pratici intorno alla ossidabilità dei metalli e delle leghe allo stato fuso.** P. Spinedo. *Metallurgia Italiana*, v. 49, May 1957, p. 363-370.

Results obtained by subjecting Pb, Cd, Sn, and Zn to hot oxidation and studying the solid and liquid phases.

14982* Corrosion. *Petroleum Week*, v. 5, July 19, 1957, p. 32 + 14 pages.

Causes and ways of combating corrosion in exploration, drilling, producing, pipelining, refining, offshore and marine, and marketing operations.

14983 Failure of WAPD-30 High Pressure Loop. M. S. Robinson. *Phillips Petroleum Co., Idaho Operations Office (U. S. Atomic Energy Commission)*, IDO-16338, Apr. 1957, 12 p. (UF767 Un3.1id Contin.)

Fixation of atmospheric N in the MTR and the existence of water at the bottom of the tube annular space, in conjunction with the operating temperature and pressure of the tube, placed the system in severely corrosive circumstances.

14984* Pitting in Ferrous System. An Annotated Bibliography. Mildred Benton, compiler. 117 p. 1957. Naval Research Laboratory, Washington, D. C. (ZTA462 B44p Ref.)

Covers books, periodical articles, both domestic and foreign, and technical report literature from 1866 to 1957.

14985 (French.) Investigations on the Oxidation Mechanism of Single Iron Crystals at High Temperature and Under Low Oxygen Pressure. **Recherches sur le mécanisme d'oxydation de cristaux uniques de fer a haute température et sous basse pression d'oxygène.** Jean Bardolle. *Publications Scientifigues et Techniques du Ministère de l'Air*, no. 327, 1957, 62 p. (TL502 F84.1p Vis.)

Study of the discontinuous superficial growth starting from oxide nuclei, at high temperature and low O pressure. Relations of orientation between the metal and the ferrous oxide. Importance of atomic and ionic density during a chemical reaction on a solid surface.

14986 (German.) Contribution to the Problem of the Life of Lead Bath Pots. **Zur Frage der Lebensdauer von Bleipfannen.** Hans Krautmacher and Wilhelm Püngel. *Stahl und Eisen*, v. 77, June 27, 1957, p. 837-845.

Corrosion rate as dependent on annealing time and temperature. Service tests: annealing of plain C and alloy steels at a bath temperature of 720 C for more than 300 hrs.

14987 Stress Corrosion Cracking and Embrittlement. William D. Robertson, editor. 202 p. 1956. John Wiley & Sons, New York. (TA462 E125e)

A collection of 14 papers presented at the Symposium on Stress Corrosion Cracking, Oct. 1954.

14988* (Russian.) Thermal Stability and Corrosion Activity of Nitrite-Nitrate Salt at Temperatures Above 500 C. **Termicheskaia stoikost' i korrozionnaia aktivnost' nitrit-nitratnogo solevogo sostava pri temperaturakh vyshe 500°C.** M. A. Tolstaia, E. I. Kairis, and V. M. Fomin. *Teploenergetika*, v. 4, July 1957, p. 60-64.

Data on thermal stability and corrosion activity with steels X18H8T, 15XM, and 20 at temperatures of 450-550 C and continuous mixing.

14989 Some Observations on Stress-Corrosion Cracking of Single Crystals of AZ61X Magnesium Alloy. F. Meller and M. Metzer. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4019, July 1957, 23 p. (TL570 Un3t)

Data from tests in 0.5 and 1% HF and in a salt-chromate solution consisting of 35 g. of NaCl and 20 g. of K_2CrO_4 per l. Path chosen by crack was attributed to mechanical rather than electrochemical factors.

14990* Corrosion. II. Contributing Factors, Protective Coatings, Materials. George E. Symons. *Water & Sewage Works*, v. 104, July 1957, p. 308-310.

Deals with water works corrosion control factors. (To be continued.)

14991* (German.) The Surface Rule of Corrosion and the Effect of Inhibitors in Electrochemical Corrosion. **Flächenregel und Inhibitorwirkung bei der elektrochemischen Korrosion.** H. E. Hömig. *Werkstoffe und Korrosion*, v. 8, June 1957, p. 321-324.

For anodically and cathodically controlled corrosion processes the surface rule is valid exactly at certain ratios of the cathodic to the anodic areas and sometimes approximately at different ratios. Assuming a simplified mechanism of certain inhibitors you can derive the effects of adding inhibitors from the general surface law mathematically.

14992* (German.) Stress Corrosion in Homogeneous Alloys, Its Condition and Its Mechanism. **Die Spannungskorrosion bei homogenen Legierungen, ihre Ursachen und ihr Mechanismus.** L. Graf. *Werkstoffe und Korrosion*, v. 8, June 1957, p. 329-344.

The most important factor influencing the susceptibility of homogeneous mixed crystals to stress corrosion cracking is the mixed crystal concentration. The reactivity along "large angle" grain boundaries and glide planes increases considerably with mixed crystal concentration, reaching a maximum at 50 at.%. Under the influence of chemical agents the mixed crystal effect is noticeable only if the attack is supported by an electrochemical process. Tensile stress is effective only if it causes local, plastic deformation.

14993* (Russian.) Effect of Ferric Oxide on the Process of Steel Oxidation in Alkali Solutions. **Vliianie okisnogo zheleza na protsess oksidirovaniia stali v rastvorakh shchelochi.** E. I. Levitina. *Zhurnal Neorganicheskoi Khimii*, v. 2, May 1957, p. 1158-1161.

Study of the solubility of ferric oxide in alkali solutions and effect of its concentration on thickness of the MgO film formed.

See also: **14541** (oxidation of metals at high temperatures); **14590** (corrosion of electric power lines).

METALS—EXTRACTION AND REFINING

14994 Molded Exothermic Linings for Hot Tops. Harry D. Shephard. *American Institute of Mining, Metallurgical and Petroleum Engineers, Preprint* 1956, Dec., 13 p. (TN706 EL25p Vis.)

Prolonged use of "Feedex," a moldable exothermic compound, has proved that ingot-to-billet yields in excess of 90% are possible. With the addition of the proper amount of water, "Feedex" may be formed into any desired shape or size, and after the proper drying cycle, the dried, hardened shape has high strength, in the neighborhood of 400 to 500 psi.

14995* (Polish.) The Melting of Copper in Vacuum. **Topienie miedzi w próżni.** Emilian Iwanciw and Jan Golonka. *Archiwum Hutnictwa*, v. 2, no. 1, 1957, p. 93-123 + 2 plates.

Melting in vacuum in the presence of C may result in almost complete removal of O from the Cu, so that the vacuum applied may be of the order of several mm. Hg.

14996 Arc Melting and Continuous Casting of Uranium. H. A. Saller, R. F. Dickerson, and E. L. Foster, Jr. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-926, July 1954, 31 p. (UF767 U3b Contin.)

Uranium was successfully arc melted and continuously cast into the form of 3-in. diameter ingots. Biscuit metal, production slugs, a 1-to-1 blend of machine chips and biscuit metal, and a 1-to-1 blend of machine chips and production slugs were melted into ingots which were evaluated by means of chemical and metallographic analysis, and measurements of density and hardness. Molybdenum electrode tips were highly unsatisfactory for U melting.

14997 Large-Batch Melting of Uranium. R. M. Lang, G. W. Rengstorff, N. H. Keyser, and H. W. Lownie, Jr. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-932, Aug. 1954, 33 p. (UF767 U3b Contin.)

Uranium ingots weighing up to 1200 lb. were prepared by induction melting U in an atmosphere of argon and pouring the melt under a protective cover of molten $BaCl_2$ or $CaCl_2$.

14998 The Distribution of Thorium-Decay Products in the Thorium-Purification Process. G. D. Calkins, M. Pobereskin, J. E. Gates, R. H. Blackmore, and J. H. Duffee. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-967, Dec. 1954, 45 p. (UF767 U3b Contin.)

14999 Calculations on Continuous Casting. J. Czikel. *Henry Brutcher Translation No.* 3853, 5 p. + 1 plate. (From *Neue Hütte*, v. 1, no. 9, 1956, p. 561-562.) Henry Brutcher, Altadena, Calif.

Nomograms for calculating the rate of descent of the bar and the pouring rate in continuous casting.

15000 Results of Experiments on Vacuum Casting of Steel. I. Ingot Stage. Z. Eminger and F. Kinsky. *Henry Brutcher Translation No.* 3861, 12 p. + 3 plates. (From *Hutnické Listy*, v. 11, no. 6, 1956, p. 345-355.) Henry Brutcher, Altadena, Calif.

Vacuum casting equipment. Effect on H content, distribution of elements in ingots, mechanical properties, macro- and microstructure, sensitivity of steel to over-heating, and susceptibility to flaking.

15001 Use of Steam-Enriched Blast-Furnace Air. F. Houdek. *Henry Brutcher Translation No.* 3869, 7 p. (From *Hutnik*, v. 5, no. 7, 1955, p. 194-196.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 1331, v. 5, Feb. 1956.

15002 Ramming of Blast-Furnace Runners With a Carbonaceous Composition. M. K. Vasil'ev. *Henry Brutcher Translation No.* 3901. 3 p. (From *Metallurg*, v. 1, no. 1, 1956, p. 20.) Henry Brutcher, Altadena, Calif.

Composition and preparation of carbonaceous ramming mix. Advantages include long service life, 90% reduction in foundry sand consumption, reduction of iron losses in runners and ladles.

15003 Effect of Blowing With Carbon Monoxide Gas in Electric Furnaces Upon Steel Quality. A. V. Vishnyakov and A. M. Samarin. *Henry Brutcher Translation No.* 3926, 16 p. + 1 plate. (From *Izvestiia Akademii Nauk SSSR, OTN*, no. 3, Mar. 1954, p. 102-109.) Henry Brutcher, Altadena, Calif.

The contents of H and N, and in most cases of O, were considerably lowered by blowing CO through liquid steel without a protective slag cover in a H.F. furnace. This increased soundness of the steel, eliminated blowholes and central porosity, and decreased the zone of columnar crystallization. Consumptions of ore, fluxes, and electrical energy are also appreciably reduced.

15004 Getting High-Purity Thorium Off to Market. *Chemical Week*, v. 80, July 13, 1957, p. 27-28.

The iodide dissociation process will soon get its first commercial-scale tryout in making superpure Th metal.

15005 Extraction and Refining of the Rarer Metals. 444 p. 1957. Institution of Mining and Metallurgy, London. (TN798 In7.5e)

Compilation of 22 papers presented at a symposium on extraction metallurgy.

15006* (Polish.) The Charging of Blast Furnaces. **Zasypywanie wsadu do wielkiego pieca.** Zygmunt Krotkiewski. *Hutnik*, v. 24, Jan. 1957, p. 1-10.

Discussion of existing charging equipment for blast furnaces from the point of view of establishing a uniform gas flow in the furnace burden. Description of new equipment constructed by T. A. Tescha and its application in charging the blast furnace.

15007* (Polish.) Examples of Application of the Ionic Theory of Slags to the Study of Quantitative Reactions Between Slag and Metal. **Przykłady zastosowania teorii jonowej żużli do ilościowego ujmowania reakcji między żużlem a metalem.** Andrzej Staronka. *Hutnik*, v. 24, Feb. 1957, p. 51-55.

Definition of a highly basic slag according to molecular and ionic theory. Equilibrium in distribution of S between a slag containing a high percentage of bases and metal. Sample calculations.

15008* (Polish.) The Problem of Steel Desulfurizing in Basic Open-Hearth Furnaces. **Zagadnienie odsiarczania stali w zasadowym piecu martenowskim.** Tadeusz Mazanek. *Hutnik*, v. 24, Feb. 1957, p. 55-58.

A method that provides more complete desulfurizing and at the same time shortens the smelting process in the open-hearth furnace.

15009* (Polish.) Heat Equilibrium in Steel Molds. **O zrównoważeniu cieplnym wlewnic stalowniczych.** Józef Přibyl. *Hutnik*, v. 24, Apr. 1957, p. 133-138.

Temperature relationships in ingot molds.

15010* (Czech.) Evaporative Cooling of Open-Hearth Furnace. **Odpařovací chlazení ocelářských pecí.** Vladimír Bulina. *Hutník*, v. 7, June 1957, p. 186-191.

Water cooling with natural or forced circulation. Pressure of the produced steam. Ways for conserving water.

15011 Two-Point Roof Temperature Control of Open-Hearth Furnaces. C. R. Ellstrom. *Instruments and Automation*, v. 30, July 1957, p. 1312-1315.

15012 Tonnage Oxygen. The Field of Application in Steelmaking. F. J. Clark and J. L. Harrison. *Iron and Steel Institute, Journal*, v. 186, July 1957, p. 305-323.

Comparative operating costs between the classical open-hearth shop, with and without O, and a combination of O application in the open-hearth and O steam-blown basic Bessemer converter. Developments in the design and construction of tonnage plants.

15013 A Thermodynamic Study of FeO-Fe_2O_3- SiO_2, FeO-Fe_2O_3- P_2O_5, and FeO-Fe_2O_3-SiO_2-P_2O_5 Molten Systems. E. T. Turkdogan and Patricia M. Bills. *Iron and Steel Institute, Journal*, v. 186, July 1957, p. 329-339.

Includes curves relating the Fe^{+++}/Fe^{++} ratio to silica and P_2O_5 concentrations for p_{CO_2}/p_{CO} ratios from 75 down to very low values where melts are in equilibrium with liquid Fe.

15014* (Russian.) Inter-Phase Stress at the Slag-Iron Boundary and Surface Tension of Melts in the System Manganese Oxide-Silica-Alumina. **Mezhfaznoe natiazhenie na granitse shlak-zhelezo i poverkhnostnoe Natiazhenie rasplavov sistemy zakis' margantsa-kremnezem-glinozem.** Sh. M. Mikiashvili, A. M. Samarin, and L. M. Tsylev. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk*, no. 4, Apr. 1957, p. 54-62.

On the basis of surface tension values, the value of interphase stress was determined.

15015* (Russian.) Vacuum Metallurgy. Deoxidation and Desulfurization in Vacuum. **Vakuumnaia metallurgiia. Raskislenie i desul'furatsiia v vakuume.** G. A. Garnyk and A. M. Samarin. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk*, no. 5, May 1957, p. 77-84.

15016* (Swedish.) A Method for Direct Reduction of Iron Ore Concentrate by Carbon Monoxide Without Melting. **Metod för direkt reduktion av järnmalmsslig med koloxid utan smältning.** Otto Stelling and Ivan Pereswetoff-Morath. *Jernkontorets Annaler*, v. 141, no. 5, 1957, p. 237-260.

Reduction of iron oxides in a fluidized bed. Determination of reaction velocities for different ores. Formation of cementite counteracts tendency to sticking.

15017 Swedish Oxygen Steelmaking. Folke Johansson. *Journal of Metals*, v. 9, sec. 1, July 1957, p. 972-975.

The "Kal-Do" process, utilizing a rotating furnace, was developed to convert high-phosphorus iron into steel of open-hearth quality using high purity O. High yield and outstanding heat economy make it economical also in the use of low-phosphorus iron. Of great importance is the fact that large amounts of ore can be used as a cooling material instead of scrap, and that the process can be used for all types of blast furnace or cupola iron in making all specifications of high or low grade C steels.

15018 Arc Melting of Reactive Metals. J. L. Ham and C. B. Sibley. *Journal of Metals*, v. 9, sec. 1, July 1957, p. 976-980.

The cold-mold arc-melting method is both versatile and practical for producing ingots of reactive metals. The trend is toward the use of vacuum rather than argon and of consumable rather than permanent electrodes.

15019 Thermodynamics of the Cu-Fe-S System at Matte Smelting Temperatures. W. A. Krivsky and R. Schuhmann, Jr. *Journal of Metals*, v. 9, sec. 1; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, July 1957, p. 981-988.

Sulfur activities were measured as a function of phase compositions in three major regions of the Cu-Fe-S system at temperatures from 1150 to 1350 C. The regions studied were: liquid mattes, liquid matte-liquid metal miscibility gap, and γ-Fe alloy liquid matte-liquid metal region. A variety of Gibbs-Duhem integrations were used to calculate activities of Cu_2S, FeS, Cu, and Fe at 1350 C from the experimental data relating S activity to composition. The experimental data generally confirm previously published phase diagrams for the Cu-Fe-S system in the temperature range from 1150 to 1350 C and establish more accurately the locations of the liquid metal-liquid matte immiscibility region and the terminus of this region with two liquids in equilibrium with the γ-Fe alloy phase.

15020 The Action of Molten Uranium on Graphite. E. L. Swarts. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission)*, KAPL-1765, Apr. 1957, 23 p. (UF767 Un3.1ka Contin.)

Long-term interaction between molten U and graphite at 1150 to 1400 C.

15021* (Hungarian.) Thermodynamic Investigation of the Processes Taking Place During the Reduction of Zinc Oxide. **A cinkoxid redukciójánál lejátszódó folyamatok termodinamikai vizsgálata.** Zoltán Horváth. *Kohászati Lapok*, v. 12, Jan.-Feb. 1957, p. 32-42.

Extensive calculations and graphic presentations of thermodynamic potential values. (To be continued.)

15022* (German.) Possibilities for the Prevention of Steel Flocculation. **Möglichkeiten zur Verhinderung der Flockenbildung im Stahl.** Wolfgang Küntscher and Karlheinz Werner. *Neue Hütte*, v. 2, May 1957, p. 280-285.

Melting method. Charging materials. Degassing of molten steel; degassing in the solid state.

15023* (German.) The Cooling of Industrial Furnaces and Particularly of Open-Hearth-Furnaces. **Abkühlen von Industrie-, insbesondere Siemens-Martin-Öfen.** Rudolf Schröter. *Neue Hütte*, v. 2, May 1957, p. 285-289.

Shortest admissible cooling rate for refractory lining; laws of cooling and possibilities for the acceleration of cooling; heat transfer and possibilities of its regulation.

15024* (Russian.) Charging of Raw Materials Into the Blast Furnace Skips by Belt Conveyers. **Transporternaia podacha materialov v skipy domennykh pechei.** N. S. Fil' and I. S. Lemberikman. *Stal'*, v. 17, June 1957, p. 493-495.

15025* (Russian.) Automatic Loading and Weighing of the Blast Furnace Burden at Charging Skips by a Belt Conveyer. **Avtomaticheskii nabor i vzveshivanie shikhty dlia domennoi pechi pri transporternoi podache v skip.** A. A. Ganich, V. F. Zarubin, and V. G. Iakoviev. *Stal'*, v. 17, June 1957, p. 496-500.

Replacement of the scale-cars by stationary weighing hoppers increases productivity.

15026* (Russian.) Development of Ball Bearing Steel Melting in Acid Open-Hearth Furnaces. **Usovershenstvovanie vyplavki sharikopodshipnikovoi stali v kislykh martenovskikh pechakh.** P. P. Semenenko, M. M. Golovanov, and I. G. Fadeev. *Stal'*, v. 17, June 1957, p. 503-507.

Development of melting process has permitted a considerable reduction in metal contamination by non-metallic inclusions.

15027* (Russian.) Dependence of the Aluminothermic Process Temperature Upon Specific Heat. **Zavisimost' temperatury aliuminotermicheskogo protsessa ot udel'noi teploty.** V. A. Bogoliubov. *Stal'*, v. 17, June 1957, p. 531-535.

Investigation of the temperature of the aluminothermic method of thermite iron production, carried out by means of a W-Mo thermocouple, and of the process thermal value, carried out by means of a calorimeter, confirms a rectilinear relation between temperature and specific heat.

15028* (Norwegian.) Kinetics of Oxidic Ore Reduction. **Kinetiske forhold ved reduksjon av oksydiske malmer.** T. Rosenqvist. *Tidsskrift for Kjemi, Bergvesen og Metallurgi*, v. 17, no. 1, 1957, p. 1-6.

Survey of some factors determining the capacity of reduction of metallic oxides. Study of the reaction mechanisms during reduction; volatile and solid reaction products. Practical application to reduction of iron oxides.

15029* Vacuum Melting. I. *Wild-Barfield Heat Treatment Journal*, v. 6, June 1957, p. 2-5.

Development of induction furnaces. (To be continued.)

15030* (Russian.) Certain Problems of Gas Flow in Shaft Furnaces. **Nekotorye voprosy dvizheniia gazov v shakhtnykh pechakh.** N. P. Tabunshchikov. *Zhurnal Prikladnoi Khimii*, v. 30, May 1957, p. 710-716.

Determination of number and size of tuyeres for introduction of blast air or O into the furnace.

See also: **14130** (properties of blast-furnace slag cements); **14136** (refractories for steelmaking); **14221** (analysis of steelmaking slags); **14272** (slag analyses); **14578** (blast furnace control); **14584** (arc furnace electric equipment); **14786** (shock waves in the blast furnace); **14981** (oxidation of molten metals).

METALS—FINISHING, POLISHING, AND CLEANING

15031* (Dutch.) Preliminary Treatment of Steel. **Voorbehandeling van staal.** C. A. Lobry De Bruyn. *Bedrijf en Techniek*, v. 12, June 1, 1957, p. 387 + 3 pages.

Formation and composition of rolling skin. Its removal by means of abrasive streams or chemical pickling. Wash primers and other treatments.

15032 On the Theory of Nitric-Acid Bright Pickling of Steel Sheet. Georg von der Dunk. *Henry Brutcher Translation No.* 3829, 6 p. (From *Stahl und Eisen*, v. 76, no. 17, 1956, p. 1138.) Henry Brutcher, Altadena, Calif.

Critical review of literature. Particulars on chemical composition of residues left behind after pickling in various acids. Preferential attack of HNO_3 on grain boundaries of steel.

15033 Finishing of Zinc Alloy Die-Castings. J. Edwards. *Metal Industry*, v. 90, June 28, 1957, p. 547-550.

Summarizes previously published information and indicates the lines being followed in current experimental work.

15034* (French.) Treatment of Used Pickling Baths of Ferrous Products. Neutralization or Sulfating? **Traitement des bains usés de décapage de produits ferreux. Neutralisation ou sulfaterie?** Jean Labergère. *Métallurgie et la Construction Mécanique*, v. 89, June 1957, p. 567 + 3 pages.

Review of essential chemical equations. Explanation of phenomena observed in practice. Treatment of baths by sulfating. Advantages of sulfuric pickling as compared with hydrochloride pickling.

15035* Coated Abrasives in Metal Finishing. J. Zoethout. *Product Finishing*, v. 10, July 1957, p. 53 + 6 pages.

Applications of backstand machines; types of abrasive belts available; contact wheels.

15036 (German.) Structure and Suitability for Pickling of the Scale of Hot-Rolled Strip. **Aufbau und Beizbarkeit von Zunder beim Warmband.** Winfrid Dahl and Werner Lueg. *Stahl und Eisen*, v. 77, June 27, 1957, p. 845-853.

Pickling tests with continuous record of the loss in weight, potential, and intensity of current.

See also: **14385** (automobile waxes); **14536** (cleaning-plant equipment).

METALS—FOUNDRY PRACTICE

15037* The CO_2 Process of Producing Moulds and Cores With Reference to Stainless and Heat Resisting Steels. C. Sargent. *British Steelmaker*, v. 23, July 1957, p. 202-205.

15038 Operating Experiences With Hot-Blast Cupolas. R. Drechsler. *Henry Brutcher Translation No.* 3935, 8 p. + 1 plate. (From *Giessereitechnik*, v. 2, no. 1, 1956, p. 4-6.) Henry Brutcher, Altadena, Calif.

Two cold-blast cupolas were converted to hot blast by the construction of a recuperator for preheating the blast. Coke consumption was decreased, temperature of the molten iron raised, and costs reduced.

15039* (French.) Sulfur in Cast Iron. **Le soufre dans les fontes.** Olivier Bader and Daniel Godot. *Fonderie*, no. 137, June 1957, p. 241-254.

Chemical affinities of S; morphology of its combinations; effects on cast iron constituents; neutralization and desulfurization; production of a high-sulfur-content malleable spheroidal casting.

15040* (French.) Plaster Casting of Beryllium Bronze. **Le moulage en platre du bronze au beryllium.** M. Louis Grand. *Fonderie*, no. 137, June 1957, p. 265-269.

Improving specimen surface by replacing molding sand with plaster results in easier polishing, low thermal conductivity, and strong relief of small details.

15041 Use of Sieve Analysis in Determining Surface Area of Sand. Robert E. Morey. *Foundry*, v. 85, Aug. 1957, p. 100-101.

15042 Selected Investigations of the Irregularities Occurring Within Sand Test-Specimens. D. C. Williams. *Foundry Trade Journal*, v. 102, June 27, 1957, p. 785-791.

Results of studies made to determine some of the variations found in 1¼ by 2-in. and 2 by 2-in. test specimens.

15043* (German.) Tests of Sand Mixers and Sand Slingers. **Versuche an Sandmisch und Sandschleudermaschinen.** Waldemar Gesell. *Giesserei*, v. 44, July 4, 1957, p. 397-404.

Effect of various mixers on distribution and resistance to compression. Cooling efficiency of slingers. Better cooling and increased crushing go together with higher throwing speed.

15044* (French.) The Low Frequency "Russ" Induction Furnace and Its Applications in the Foundry. **Le four a induction a basse frequence "russ" et ses applications en fonderie.** *Journal du Four Electrique*, v. 62, May-June 1957, p. 105-109.

Furnaces for small foundries using non-ferrous metal and for cast iron foundries. Processes used and capacity limits.

15045* (Russian.) Formation of Sand Crust on Steel Castings. **Formirovanie prigara na stal'nykh otlivkakh.** B. B. Guliaev and Iu. F. Borovskii. *Liteinoe Proizvodstvo*, no. 6, June 1957, p. 5-7.

Investigation of mechanical and chemical reactions between steel and sand molds during casting process as an attempt to explain formation of sand crust.

15046* (Russian.) Induction Crucible Furnace Using a Commercial Frequency for Melting Light Alloys. **Induktsionnye tigel'nye pechi promyshlennoi chastoty dlia plavki legkikh splavov.** V. A. Iakovlev. *Liteinoe Proizvodstvo*, no. 6, June 1957, p. 8-15.

Description of furnace, its operating principles, and its industrial advantages over other induction furnaces.

15047 Use of Limit Switches for Die Movement Control on Semi-Automatic Machines. E. N. Field. *Machinery (London)*, v. 90, June 28, 1957, p. 1466-1473.

Micro-switches will interrupt the die-casting cycle when necessary in order to avoid damage. Application to control of die closing, power and hand operated core movement, insert loading, and ejectors.

15048* Is CO_2 Necessary? Carl E. Wulff. *Modern Castings*, v. 32, Aug. 1957, p. 28-29.

For small sodium silicate-bonded cores, hardening can be accomplished by using dry nitrogen or dry compressed air. Larger cores require CO_2 gas to produce the initial set.

15049* Technology for Casting Titanium. G. H. Schippereit, R. M. Lang, and J. G. Kura. *Modern Castings*, v. 32, Aug. 1957, p. 33-48.

This comprehensive report on the progress of research on Ti casting deals with several types of melting furnaces, molding materials and processes, properties of alloys, casting design, and potential markets for the next decade.

15050* Steel Foundry Speeds Coremaking. David McGowan and Earl Bewig. *Modern Castings*, v. 32, Aug. 1957, p. 52-53.

Corn-sugar binder reduces baking time and improves casting quality.

15051* (Hungarian.) New Methods for the Production of Aluminum-Bronze Shaped Castings. **Az alakos alumínium-bronz-öntés útjai.** Gyula Emöd. *Öntöde*, v. 8, Jan.-Feb. 1957, p. 27-34.

Investigations on combating shrinkage and oxidation. The effect of Ti, gas pressure, and preheated risers.

15052* (Czech.) Casting of Steel Rolls for Blooming Mills. **Odlévání ocelových válců pro blokovou trat.** Rudolf Hroch and Artur Koval. *Slévárenství*, v. 5, June 1957, p. 161-168.

15053* (Czech.) Exothermic Risers and Their Practical Use. **Exothermické nálitky a jejich provozní použití.** Václav Lupač. *Slévárenství*, v. 5, June 1957, p. 168-171.

By means of thermite-based exothermic riser sleeves a considerable increase in metal yield and a decrease in costs for the removal of risers was obtained.

15054 Air Setting Speeds Coremaking. Daniel R. Chester. *Steel*, v. 141, July 22, 1957, p. 120 + 2 pages.

Fewer rods, especially those used to support the green core, are needed; baking times are reduced by one third; a hard core with excellent collapsibility is produced; dimensions are held accurately because the core is not removed until it has hardened in the corebox.

See also: **14248** (analysis of foundry materials); **14957** (die-casting alloys); **15088** (properties of cast steel); **15179** (spheroidization of cast iron); **15534** (welding procedures).

METALS—HEAT TREATMENT

15055 Heat Treatment and Properties of the Uranium-5 w/o Zirconium Alloy. H. A. Saller, F. A. Rough, and A. A. Bauer. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-915, May 1954, 28 p. (UF767 U3b Contin.)

Varying the heat treatment yields a range of properties.

15056 Quench and Temper Process for the Manufacture of High Strength Tubular Products. II. H. B. Emerick. *Blast Furnace and Steel Plant*, v. 45, July 1957, p. 721 + 6 pages.

The process of continuous heating, water spray quenching, and tempering produces tubular products with superior mechanical properties and performance characteristics.

15057* Steam Atmosphere Heat Treatment. *Canadian Metalworking*, v. 20, June 1957, p. 50-52.

Heat treatment with the use of steam atmosphere and electric heat can provide advantages such as improved wear resistance, longer life, better machinability, and greater corrosion resistance. Typical applications in both ferrous and non-ferrous fields are discussed.

15058 Hardening of Beryllium-Copper Springs. *Mainspring*, v. 17, June-July 1957, p. 4-7.

15059* (French.) The O. N. E. R. A. Process of Skin Annealing in a Gaseous Medium. Application to the Bright Annealing of Refractory Steels and Alloys. **Le procédé O. N. E. R. A. de recuit de surface (skin annealing) en milieu gazeux. Application au recuit brillant des aciers et alliages réfractaires.** Ph. Galmiche. *Recherche Aéronautique*, no. 59, July-Aug. 1957, p. 27-32.

Reducing fluorine atmospheres obtained by introduction of metallic fluorides often eliminates oxidation difficulties in the heat treatment of refractory alloys. Application to surface annealing of gas-turbine blades.

15060* (French.) Surface Hardening With the Oxyacetylene Torch. **La trempe superficielle au chalumeau oxyacétylénique.** Marcel Vilez. *Revue de la Soudure (Brussels)*, v. 13, no. 2, 1957, p. 67-77.

Methods of operation; factors to be considered such as gas flow, distance and angle of flame to surface under treatment, and oxygen-acetylene volume ratio.

15061 Vacuum Heat Treating Takes Hold. R. R. Giler. *Steel*, v. 141, July 15, 1957, p. 108-110.

Jobs range from the degassing and stress relieving of Ti to brazing of stainless at high temperatures.

15062 Gas Converters. A Survey of the Operation and Control of Exothermic and Endothermic Converters. Walter Holcroft. *Steel Processing and Conversion*, v. 43, July 1957, p. 398-402.

Types of protective atmospheres; control of factors which influence the final gas produced by the converters.

15063* Some Practical Aspects of Pack Carburising. *Wild-Barfield Heat Treatment Journal*, v. 6, June 1957, p. 11-15.

A few notes on this old, but not obsolete process.

See also: **14986** (annealing plain carbon and alloy steels); **15161** (annealing cold-worked Mo); **15163** (precipitation hardening); **15224** (annealing of mild steel welds).

METALS—MECHANICAL AND PHYSICAL PROPERTIES

15064 The Strength of an Alloy Containing Zones. A. Kelly and M. E. Fine. *Acta Metallurgica*, v. 5, July 1957, p. 365-367.

Rough estimates are made of the stress necessary to force a dislocation through a Guinier-Preston zone in an Al alloy containing 2 at.% Cu and in one containing 13 at.% Ag. The process of shearing the zones determines the initial flow-stress in these age-hardening alloys.

15065* (French.) The Theory of Faults in Crystal Structure in Relation to the Engineering Properties of Metals. **La théorie des dislocations cristallines dans ses rapports avec les propriétés techniques des metaux.** Adrienne R. Weill. *Âge Nucléaire*, no. 4, May-June 1957, p. 40-47.

Theory takes into account the possibility of the fault having an effect on the atomic structure in macroscopic phenomena. The existence of a state of crystallization intermediate between hardening and complete setting has been recognized in finished and semi-finished metal products. This polygonized state confers special properties, on the substance, the study of which enables certain engineering materials to be classified in relation to this utilization.

15066 A Versatile Control Equipment for Fatigue Testing. W. F. Coulshed and D. S. Moore. *Aircraft Engineering*, v. 29, July 1957, p. 219-221.

Description of an electronic control unit for fluctuating load cycles.

15067 Magnesium-Cadmium Alloys. VIII. Heat Capacities of Mg_3Cd and $MgCd_3$ Between 20 and 290°. The Standard Heats, Free Energies and Entropies of Formation and the Residual Entropies. W. V. Johnston, K. F. Sterrett, R. S. Craig, and W. E. Wallace. *American Chemical Society, Journal*, v. 79, July 20, 1957, p. 3633-3637.

Data reveal a specific heat anomaly of the customary type for alloys undergoing order-disorder transitions, with peak values at 83.8 and 150.6 C for $MgCd_3$ and Mg_3Cd, respectively. The residual entropy of Mg_3Cd was found to be 0.03 ± 0.04 e.u./g. atom and the corresponding quantity for $MgCd_3$ is 0.16 ± 0.04.

15068 The Effects of Strain Rate and Temperature on the Stress-Strain Relations of Deep-Drawing Steel. R. J. MacDonald, R. L. Carlson, and W. T. Lankford. Paper from "American Society for Testing Materials, Proceedings". v. LVI. 1956. p. 704-723. (TA401 Am35p Vis.)

The effects produced by a range of strain rates (0.002 to 0.8 in. per in. per sec.) and temperatures (75 F to 300 F) on the stress-strain properties of fully Al-killed temper-rolled steel were studied. Variations of these values markedly affect yield point phenomena and work-hardening characteristics.

15069 Effect of Geometry on the Properties of C4A-T6 and SG60A-T6 Aluminum-Alloy Castings. W. H. Johnson and H. F. Bishop. Paper from "American Society for Testing Materials, Proceedings". v. LVI. 1956. p. 724-737. (TA401 Am35p Vis.)

Tensile properties were determined at various locations in castings of different thicknesses and geometries and compared with properties obtained from separately cast test bars. It is shown that special molding and melting processes may be used to develop properties in castings which approach or exceed test bar properties.

15070 Effect of Irradiation on the Mechanical Properties of Zirconium. R. S. Kemper, Jr. and W. S. Kelly. Paper from "American Society for Testing Materials, Proceedings". v. LVI. 1956. p. 823-833. (TA401 Am35p Vis.)

Material in six initial states, annealed and with 10, 20, 30, 40, and 50% reduction of area by cold swaging, was irradiated at 50 to 60 C to integrated thermal flux levels of approximately 5.7×10^{19}, 1.5×10^{20}, and 2.4×10^{20} nvt. The results of post-irradiation vacuum annealing at 250, 300, and 350 C of tension specimens are given.

15071 Fatigue Crack Propagation in Aluminum Alloys. M. S. Hunter and Wm. G. Fricke, Jr. Paper from "American Society for Testing Materials, Proceedings". v. LVI. 1956. p. 1038-1046. (TA401 Am35p Vis.)

Metallographic observation of fatigue cracks in Al alloys from their inception to final complete failure of the specimen has revealed the manner in which fatigue cracks form, propagate, and interact.

15072 The Notched Fatigue Properties of Some Titanium Alloys. A. W. Demmler, Jr., M. J. Sinnott, and L. Thomassen. Paper from "American Society for Testing Materials, Proceedings". v. LVI. 1956. p. 1051-1062. (TA401 Am35p Vis.)

Study of the notched rotating-beam fatigue life characteristics of three commercial Ti alloys and two experimental alloys. Influence of various notch shapes and of different means of preparing these notches.

15073* (German.) Behavior of Heat Resistant Steels in Static Tests of Long Duration at 500-700 C. **Verhalten warmfester Stähle im Langzeit-Standversuch bei 500 bis 700° C.** *Archiv für das Eisenhüttenwesen*, v. 28, May-June 1957, p. 245-323.

Tensile strength, fatigue strength, and hardness of 35 ferritic and austenitic steels and 9 Fe-poor alloys maintained at 500-700 C up to 100,000 hr. Studies on ferritic boiler tube steels, ferritic machine construction steels, and austenitic steels and alloys; metallographic studies; fatigue data at 500-650 C on ferritic and austenitic steels; comparisons of long-term with short-term tests.

15074* (Polish.) Anisotropy of Mono- and Polycrystalline Metal of the Structure A_1 **Anizotropia mono- i polikrystalicznego metalu o strukturze A_1.** Aleksander Krupkowski. *Archiwum Hutnictwa*, v. 2, no. 1, 1957, p. 9-46.

Deals with the theory of deformation of a test-piece cut out in any direction from the monocrystal. Straining of such a test-piece while maintaining the same initial direction during the total range of deformation is probable only under the assumption of a complex slip occurring in two or more slip planes and three or more slip directions.

15075* (Polish.) The Influence of the Deformation Velocity on the Magnitude of Tensions During Tensile Tests. **Wpływ predkości odkształcenia na wielkość naprężeń przy próbie rozciągania.** Jerzy Wantuchowski. *Archiwum Hutnictwa*, v. 2, no. 1, 1957, p. 47-92.

15076 Determination of Thermal Conductivities of Metals by Measuring Transient Temperatures in Semi-Infinite

Solids. S. T. Hsu. *ASME, Transactions*, v. 79, July 1957, p. 1197-1203.

The temperature on the flat side of a semi-infinite solid is suddenly raised to a certain value. Then at two stations inside the solid, the temperature variations with time are recorded by means of thermocouples, a string galvanometer, and synchronized photographic equipment.

15077* (Russian.) Development of Porosity in Uranium by Cyclic Thermal Treatment. **Razvitie poristosti v urane pod deistviem tsiklicheskoi termoobrabotki.** A. A. Bochvar and G. I. Tomson. *Atomnaia Energiia*, v. 2, June 1957, p. 520-524 + 2 plates.

Behavior of U during a 50-sec. cyclic thermal treatment at α-phase and α-β-γ transformation temperatures.

15078* The Tensile Properties of Pearlitic Nodular Irons in Air and Water. G. N. J. Gilbert. *British Cast Iron Research Association, Journal of Research and Development*, v. 6, June 1957, p. 630-637.

Strengths and elongation are substantially reduced in water or aqueous solutions and in Hg. Reduction is greater in normalized than in as-cast irons.

15079* The High Temperature Tensile Properties of Nodular Graphite Cast Irons. K. B. Palmer. *British Cast Iron Research Association, Journal of Research and Development*, v. 6, June 1957, p. 638-659 + 6 plates.

Two pearlitic and two ferritic irons were tested at temperatures up to 600 C. Elongations of the ferritic materials decreased slightly up to 400 C, then increased rapidly. Tensile strength and proof stresses remained fairly constant up to 350 C, then decreased rapidly. The two pearlitic materials had similar properties at room temperature, but wide variations at higher temperatures instigated a study of the effect of small amounts of residual elements. Both As and P were found to significantly improve tensile strength and elongation of pearlitic irons; ferritic irons were unaffected by additions of As. Short-term creep tests showed that arsenic-containing irons creep at slightly higher rates than arsenic-free irons; normalized irons creep much faster than as-cast irons. Arsenic also promotes the formation of spheroidal graphite nodules. The tensile strength of a low P iron falls rapidly with increasing temperature, while an iron containing 0.1% P or As maintains a higher strength with increased elongation up to 500 C. No explanation for this effect is yet available.

15080 Brittle Behavior of Engineering Structures. Earl R. Parker. 323 p. 1957. John Wiley & Sons, New York. (TA473 P22b)

Theories and mechanism of failure; test methods used for evaluating relative brittleness; interpretations and summaries of test results; effects of welding and composition variations on notch toughness; service failures.

15081 Effect of Residual Stresses Upon the Fatigue Strength of Shafts Carrying Tight Sleeves. I. V. Kudryavtsev and N. M. Savvina. *Henry Brutcher Translation No.* 3847, 9 p. + 1 plate. (From *Metallovedenie i Obrabotka Metallov*, v. 1, no. 5, 1955, p. 17-23.) Henry Brutcher, Altadena, Calif.

Surface strain hardening is an extremely effective means of increasing the endurance limit of sleeved shafts, due to the production of residual compressive stresses in the accessible parts of the shafts. Suitable heat treatment is also effective.

15082 Influence of Some Alloying Elements on the Susceptibility of Steel to Temper Embrittlement. M. L. Bernshtein. *Henry Brutcher Translation No.* 3855, 12 p. + 1 plate. (From *Metallovedenie i Obrabotka Metallov*, v. 2, no. 9, 1956, p. 25-30.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 1146, v. 6, Jan. 1957.

15083 Effect of Hydrogen on the Mechanical Properties of Steel. P. V. Sklyuev, L. I. Kvater, and V. E. Shapiro. *Henry Brutcher Translation No.* 3931, 17 p. + 1 plate. (From *Stal'*, v. 16, no. 10, 1956, p. 909-915.) Henry Brutcher, Altadena, Calif.

Experimental study of effect of H on ductility of steel with reference to its chemical and phase composition, yield strength, and testing temperature (atmospheric and sub-zero).

15084* (French.) Effect of Thickness on the Electromotive Thermoelectric Force of Thin Aluminum and Cobalt Films. **Influence de l'épaisseur sur la force électromotrice thermoélectrique de lames minces d'aluminium et de cobalt.** France Savornin. *Comptes Rendus*, v. 245, July 8, 1957, p. 147-149.

Studies of vapor-deposited Al and Co films. The thermoelectric forces were increased by oxidation of the metal. Effect of oxidation was much smaller on the Co coatings.

15085 Creep and Recovery. 372 p. 1957. American Society for Metals, Cleveland. (TA459 Am35c)

A collection of papers concerned with thermodynamics, defects, the recovery of various physical and mechanical properties, the interaction of dislocations and vacancies and grain boundary behavior in creep of crystalline metals, and creep of crystalline nonmetals, specifically Al_2O_3.

15086* (Russian.) On Elastic After-Effect in Carbon Steels. **K voprosy ob uprugom posledeistvii v uglerodistykh staliakh.** A. V. Briukhanov. *Doklady Akademii Nauk SSSR*, v. 113, Apr. 11, 1957, p. 1046-1049.

Experiments with low carbon steel "U2" and an eutectoid steel.

15087* (Russian.) On the Brittleness of Chromium. **O khrupkosti khroma.** S. T. Kishkin and I. O. Panasiuk. *Doklady Akademii Nauk SSSR*, v. 113, Apr. 21, 1957, p. 1263-1264.

Effects of temperature on brittleness.

15088 Improving the Mechanical Properties of Cast Steel. B. B. Guljajew. *Foundry Trade Journal*, v. 103, July 4, 1957, p. 5 + 6 pages.

Effect of defects on properties, with usual manner in which these defects are overcome.

15089 A Note on the Metallography of Cracking During Creep. D. McLean. *Institute of Metals, Journal*, v. 85, pt. 2, July 1957, p. 468-472 + 1 plate.

Microspecimens of 57 test-pieces of certain commercial creep-resistant metals, broken in creep tests at various stresses and temperatures, were examined in a study of the inception of fracture under different conditions.

15090 The Effect of Heat-Treatment and Structure on the Creep and Stress-Rupture Properties of Nimonic 80A. W. Betteridge and A. W. Franklin. *Institute of Metals, Journal*, v. 85, pt. 2, July 1957, p. 473-479 + 2 plates.

Factors controlling creep characteristics are time and temperature of solution treatment, manner of precipitation of Cr_3C_2, and time and temperature of the normal hardening phase $Ni_3(Ti,Al)$.

15091 Intercrystalline Cracking in Creep of Some Aluminium Alloys. B. J. Nield and A. G. Quarrell. *Institute of Metals, Journal*, v. 85, pt. 2, July 1957, p. 480-488 + 1 plate.

A systematic study of the occurrence of intercrystalline cracking during creep in two high-purity base-Al alloys containing 1.28 wt.% Mn and 5.15 wt.% Mg, respectively.

15092 (French.) Study of the Embrittlement of α-Structure Steels by Room-Temperature Introduction and Diffusion of Hydrogen. **Contribution à l'étude de la fragilisation des aciers de structure alpha par l'hydrogène introduit à froid et à la diffusion de l'hydrogène dans les mêmes aciers.** P. Amiot. *Institut de Recherches de la Sidérurgie, Publications*, ser. A, no. 158, Apr. 1957, 80 p. (TN602 In7p Vis.)

Tensile tests; effects of cold working on embrittlement. Delayed fractures in the presence of cathodic H. Potentiometric and volumetric measurements of diffusion.

15093 A Study of Temper-Brittleness in Cr-Mn Steel Containing Large Amounts of Molybdenum, Tungsten, and Vanadium. A. E. Powers. *Iron and Steel Institute, Journal*, v. 186, July 1957, p. 323-328.

Data on the effect of Mo up to 2%, W up to 4%, V up to 1½%, and combinations of these elements, on the susceptibility to temper-brittleness of a Cr-Mn steel. Results are discussed on the basis that susceptibility is controlled by the interaction energy for intergranular segregation of the solute alloying elements and by the diffusion rates of the segregating elements.

15094 Thermoelectric Power and Resistivity of Solid and Liquid Germanium in the Vicinity of Its Melting Point. C. A. Domenicali. *Journal of Applied Physics*, v. 28, July 1957, p. 749-753.

The thermoelectric power of Ge against Pt was measured between room temperature and 1030 C. The resistivity of Ge decreases by a factor of approximately 19 upon melting, and is approximately 63 microhm-cm. in the liquid phase.

15095 Hall Effect and Ferromagnetism of Very Thin Nickel Films. R. Coren and H. J. Juretschke. *Journal of Applied Physics*, v. 28, July 1957, p. 806-809.

Hall effect measurements were used to determine the two Hall constants and the magnetic properties of Ni films less than 100 A thick at room temperature.

15096 Effects of Compression and Annealing on the Structure and Electrical Properties of Germanium. E. S. Greiner, P. Breidt, Jr., J. N. Hobstetter, and W. C. Ellis. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, July 1957, p. 813-818.

Dislocations introduced by plastic flow and stored in the material are shown to exist as an array on the active slip planes. Annealing at high temperature after deformation slowly decreases the number of stored dislocations, apparently by internal cancellation. Recrystallization does not occur. Electrical conductivity changes are consistent with the view that both dislocations and point defects are introduced by the deformation. At room temperature in *n*-type Ge having conductivity as low as 5.7 $(\text{ohm-cm})^{-1}$, the dislocations seem to have very little effect; the point defects constitute substantially all the effective acceptor centers. These acceptor centers increase in number with the amount of deformation at low temperatures such as 525 C, but are rapidly annealed out at higher temperatures such as 725 C. Electrical conductivity measurements of Ge appear to provide an important tool for the study of point defects.

15097 On a Mechanism of High Temperature Intercrystalline Cracking. C. W. Chen and E. S. Machlin. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, July 1957, p. 829-835.

The formation of voids at grain boundaries is considered to be primarily responsible for the brittle failure of metals at elevated temperature. Void nuclei are developed as a consequence of grain boundary slip and once nucleated, grow either by vacancy condensation or plastic yielding or both.

15098 Tensile Properties of Zone Refined Iron in the Temperature Range From 298° to 4.2°K. R. L. Smith and J. L. Rutherford. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, July 1957, p. 857-864.

Evaluation of tensile properties indicates that the higher the purity, the lower the flow stresses and the better the low temperature ductility. Yield stresses as low as 3800 psi. were observed at room temperature and elongations of 10% were observed at 4.2 K. The major portion of the ductility at 4.2 K arises from twinning. Deformation by twinning at 4.2 K is not suppressed by prestraining at room temperature and the twins occur all through the test. Slip traces were observed to initiate at the ends of previously formed twin traces.

15099 Electrical Resistivities and Phase Transformations of Lanthanum, Cerium, Praseodymium, and Neodymium. F. H. Spedding, A. H. Daane, and K. W. Herrmann. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, July 1957, p. 895-897.

15100 Temperature Dependence of the Hardness of Secondary Phases Common in Turbine Bucket Alloys. J. H. Westbrook. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, July 1957, p. 898-904.

Representative examples of the most common types of secondary phases in turbine bucket alloys were synthesized in bulk and their hardness measured from room temperature to 800 C.

15101 Shear Along Grain Boundaries in Aluminum Bicrystals. S. K. Tung and R. Maddin. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, July 1957, p. 905-910.

The mechanism for grain boundary shear is considered to be a combination process involving slip and grain boundary self-diffusion.

15102 Abrupt Yielding and the Ductile-to-Brittle Transition in Body-Centered-Cubic Metals. E. T. Wessel. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, July 1957, p. 930-935.

The relationship of brittle fracture to the early stages of plastic deformation, particularly pronounced yielding, is examined and a mechanism proposed.

15103* (Hungarian.) The Effect of Titanium on the Properties of Case-Hardenable Manganese Steel. **A titán hatása a betétben edzhető mangánacélok tulajdonságaira.** Nándor Hajtó. *Kohászati Lapok*, v. 12, Jan.-Feb. 1957, p. 3-14.

Study of optimum Ti content for best properties of case and core of case-hardened steel on the basis of 17 different laboratory specimens. Investigation of adaptability of laboratory methods to pilot-plant production of Ti-modified steels.

15104* (Dutch.) Hydrogen Embrittlement of Copper. **De waterstotziekte van koper.** H. T. Schaap. *Metalen*, v. 12, June 15, 1957, p. 204-208.

Copper containing more than .01 wt.% O becomes brittle when heated above 400 C in H. Hydrogen diffusing into Cu_2O reduces this oxide to metallic Cu and water vapor. The resulting high pressures of water vapor cause local rupture along grain boundaries and embrittlement, since the diffusion of H in Cu is much higher than that of water vapor. Oxygen must be present as Cu_2O or as oxides of other metals whose affinity for O is not much greater than that of Cu and which show a measurable solubility in Cu. It is doubtful that O in solid solution can cause embrittlement. Small quantities of atmospheric water vapor are harmful only in the presence of a material dissociating the water vapor.

15105 Ductility of Molybdenum. *Metal Industry*, v. 91, July 5, 1957, p. 6 + 1 page.

The ductilities of several alloys were compared by bend tests at various temperatures and carried out on flat specimens cut from the ingots in such a way that the columnar grains lay across the length of the strip.

15106* (Russian.) Study of the Deformation Zone During Creep. **Issledovanie zony razrusheniia pri polzuchesti.** I. L. Mirkin and I. I. Trunin. *Metallovedenie i Obrabotka Metallov*, no. 6, June 1957, p. 2-7.

A 12 to 14% decrease of microhardness in steel EI10 was observed near the cracks formed during creep.

15107* (Russian.) Relationship Between Fatigue and the Long Term Strength of Alloys at High Temperatures. **Sootnoshenie mezhdu vynoslivost'iu i dlitel'noi prochnost'iu splavov pri povyshennykh temperaturakh.** V. A. Parfenov. *Metallovedenie i Obrabotka Metallov*, no. 6, June 1957, p. 17-23.

Studies of failures of alloys due to fatigue as shown by short-time tests (200-500 hrs.) and to static loads, as shown by long-time tests.

15108* (Russian.) Hot Crack Formation Mechanism in Welded Seams. **O mekhanizme obraziovaniia goriachikh treshchin v svarnykh shvakh.** V. A. Toropov. *Metallovedenie i Obrabotka Metallov*, no. 6, June 1957, p. 54-58.

Effects of alloy composition, temperature, and character of intercrystalline boundaries on cracking tendency.

15109 Relative Creep Resistance of Cast Al-Si-Cu Alloys to LM4 and LM21. J. McKeown and R. D. S. Lushey. *Metallurgia*, v. 56, July 1957, p. 27-28.

Comparative creep tests on the alloys containing respectively, 0.35% and 2% Zn show that there is no marked difference in behavior at 200 C in the normal life of an internal combustion engine.

15110* (French.) Using the Russel Effect in Studying the Influence of Mechanical Strains on Metallic Surfaces. **Étude de l'influence des contraintes mécaniques sur les surfaces métalliques au moyen de l'effet Russel.** C. Berger. *Métaux, Corrosion-Industries*, v. 32, May 1957, p. 185-190.

Studies of surface perturbations caused by the strains in Al and other metals.

15111* (French.) Heat Resistance Behavior of Titanium and Its Alloys. **Le comportement à chaud du titane et de ses alliages.** R. Syre. *Métaux, Corrosion-Industries*, v. 32, May 1957, p. 201-207.

Tensile and fatigue properties of commercial alloys at elevated temperatures. Good results were obtained with alloys containing Al.

15112* (German.) Grain Boundary Damage of a Cr-Ni-W Steel as a Consequence of Overheating. **Korngrenzenschädigung eines CrNiW-Stahles durch Überhitzen.** Jerzy Ogerman. *Neue Hütte*, v. 2, May 1957, p. 289-299.

Influence of elevated heating temperatures (1200 to 1350 C), heating time, cooling rate, degree of deformation, and state of heat treatment upon the rupture appearance of a Cr-Ni-W steel.

15113 Effect of Sodium on the Mechanical Properties of Zirconium. J. C. Bokros. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-1867, June 1957, 39 p. (UF767 Un3.1na Contin.)

Surface oxide which develops on Zr in Na significantly lowers the fatigue life at elevated temperatures, but has little effect on tensile properties. Data also indicate that Zr is stable to dimensional changes after thermal cycling.

15114* (English.) **Magnetic Susceptibility of Iron-Nickel Alloys in Liquid and Solid States.** Yasuaki Nakagawa. *Physical Society of Japan, Journal*, v. 12, June 1957, p. 700-707.

Susceptibilities of alloys with less than 60% Ni increase discontinuously on melting, while those of alloys with more than 60% Ni decrease. Temperature variation of the susceptibilities is approximately expressed by the Curie-Weiss law in the liquid state as well as in the solid state, but the Curie constants and the paramagnetic Curie temperatures of liquids are in general different from those of solids.

15115 Testing Machine for Short-Time Creep and Stress-Rupture Testing at 2000 to 2500°C. Morton C. Smith, D. M. Olson, and Harry L. Brown. *Review of Scientific Instruments*, v. 28, July 1957, p. 543-547.

Specimen contained within a water-jacketed vessel is heated in vacuum or in a gas atmosphere by a tantalumtube resistance heater, and is then subjected to static tensile loads up to 100,000 psi.

15116* (English.) **Influence of Addition of Nickel on the Thermal Expansion, the Rigidity Modulus, and Its Temperature Coefficient of the Alloys of Cobalt, Iron, and Vanadium.** Hakaru Masumoto, Hideo Saitô, and Kimiyosi Gotô. *Science Reports of the Research Institutes, Tôhoku University*, ser. A, v. 9, June 1957, p. 159-169.

The largest positive value of the temperature coefficient of rigidity modulus in the plain ternary alloy of Co, Fe, and V shifted to the side of low Co content with the addition of Ni and finally reached the composition of about 35% of Ni in the binary side of Fe and Ni.

15117* (English.) **Influence of Addition of Copper on the Characteristics of an Elinvar Type Alloy "Co-Elinvar". I. Alloys Containing 5 Per Cent of Copper.** Hakaru Masumoto, Hideo Saitô, and Yutaka Sugai. *Science Reports of the Research Institutes, Tôhoku University*, ser. A, v. 9, June 1957, p. 170-175.

The influence of Cu on the thermal expansion, rigidity modulus and its temperature coefficient of the alloys of Co, Fe, and Cr has been determined. Elinvar type alloys containing comparatively high Cr have larger rigidity modulus than 8×10^5 kg. per cm.^{2}, an important characteristic for practical applications.

15118* (Dutch.) Testing and Examining Transformer Steel. **Keuring en onderzoek van transformatorplaat.** H. B. Boerema. *Smit Mededelingen*, v. 12, Apr.-June, 1957, p. 51-61.

A survey of the most important properties of modern grades of transformer steel; coherence of these properties and available methods for determination of their magnitudes.

15119 (German.) The Effect of Segregation, Cold Working and Aging on the Notch Toughness of Structural Steels of the Rimming Type. **Der Einfluss von Seigerungen, Kaltverformung und Alterungsbehandlung auf die Kerbschlagzähigkeit unberuhigter weicher Baustähle.** Hermann Schenck and Eugen Schmidtmann. *Stahl und Eisen*, v. 77, June 13, 1957, p. 784-791.

15120 (German.) Considerations Regarding the Question of the Adequate Use of the Notch Toughness Value in the Current Assessment of the Tendency to Brittle Fracture and of the Weldability of Conventional Structural Steels. **Überlegungen zur Frage der zweckmässigen Verwendung der Kerbschlagzähigkeit in der laufenden Beurteilung von Sprödbruchsicherheit und Schweisseignung üblicher Grossbaustähle.** Heinz Kornfeld. *Stahl und Eisen*, v. 77, June 13, 1957, p. 792-798.

15121 The Metallographic View. XXXVI. The High Speed Steels—Properties After Tempering. Howard E. Boyer. *Steel Processing and Conversion*, v. 43, July 1957, p. 330 + 2 pages.

Effect of tempering temperature on hardness and structure of M-2 high-speed steel after air cooling from 2200 to 2350 F.

15122* (Russian.) The Effect of Large Ductile Deformations on Durability of the Austenitic Steels. **Vliianie bol'shikh plasticheskikh deformatsii na prochnostnye svoistva austenitnykh stalei.** I. V. Kudriavtsev and T. V. Naumova. *Teploenergetika*, v. 4, July 1957, p. 64-67.

15123* (Russian.) Investigation of Properties of Al-Fe-Mn Bronzes. **Issledovanie svoistv aliuminievo-zhelezo-margantsovistykh bronz.** M. V. Mal'tsev and V. N. Vigdorovich. *Tsvetnye Metally*, v. 30, June 1957, p. 62-67.

Mechanical properties and microstructure of bronzes containing 3% Fe, 1.5% Mn, and 6-11% Al.

15124 Investigation of the Effects of Hot-Cold Work on the Properties of Molybdenum Alloys. M. Semchyshen and Robert Q. Barr. *Wright Air Development Center, Materials Laboratory, WADC Technical Report* 56-454, Jan. 1957, 118 p. (TL507 Un3.18w Vis.)

Two alloys, Mo-0.28% Nb and Mo-0.50% Ti, were investigated from the standpoint of effect of fabrication variables on the degree of strain hardening and the resultant mechanical properties, and on subsequent resistance to softening with exposure to elevated temperatures.

15125 An Investigation of Three Ferritic Steels for High-Temperature Application. A. Phillip Coldren and James W. Freeman. *Wright Air Development Center, Materials Laboratory, WADC Technical Report* 57-40, Apr. 1957, 107 p. (TL507 Un3.18w Vis.)

A survey of relationships between microstructure and properties at 700 to 1100 F for low-alloy, hardenable steels. A Ni-Cr-Mo and two Cr-Mo-V steels were studied. In general bainitic structures gave the best properties. However, for the Cr-Mo-V steels, pearlites formed at relatively low temperatures were often as strong or stronger than the bainites.

15126* (German.) Strength Characteristics of Titanium Welded Joints. **Festigkeitseigenschaften von Titanschweissverbindungen.** Karl Bungardt and Klaus Rüdinger. *Zeitschrift für Metallkunde*, v. 48, June 1957, p. 335-340.

Stretch limit, tensile strength, elongation, crack resistance, notch impact strength and alternating bending strength in weld and heat-affected transition areas; gas absorption during welding; corrosion resistance and malleability.

See also: **14587** (electrical resistivity of wire); **14641** (hardness of boron coatings); **14830** (cracks in Cr plate); **14940** (fracture of machine parts); **15055** (properties of U-5 w/o-Zr alloy); **15161** (electrical resistance of Mo); **15169** (plastic deformation and recrystallization of Al); **15184** (creep-rupture properties of Ni-Cr alloys); **15280** (radiation damage); **15329** (cyclotron resonance in metals); **15353** (specific heats of Sn, W, and noble metals); **15357** (deformation of AgCl); **15358** (elasticity, fracture, and flow theory); **15515** (embrittlement in welding austenitic steels); **15525** (weldability and physical properties of steels); **15531** (fatigue properties of welds).

METALS—MECHANICAL WORKING

15127* (German.) Determination of the Power Demand of Sheet Roller Straightening Machines. **Die Berechnung des Leistungsbedarfs der Blechrollenrichtmaschinen.** A. Geleji and G. Dévényi. *Acta Technica Academiae Scientiarum Hungaricae*, v. 17, nos. 3-4, 1957, p. 361-380.

Power demand is calculated using the formula deduced for the deformation work of sheet-straightening. Results of measurements executed on different kinds of sheet straightening mills are given.

15128 Milling High-Tensile Steel. *Aircraft Production*, v. 19, July 1957, p. 279-281.

Some notes on the use of Strasmann roughing cutters.

15129 The Influence of Lead on Metal-Cutting Forces and Temperatures. M. C. Shaw, P. A. Smith, E. G. Loewen, and N. H. Cook. *ASME, Transactions*, v. 79, July 1957, p. 1143-1154.

Effects of additions of Pb and S to steel upon tool-face friction, cutting energy per unit volume, and tool-face temperature.

15130 Force Relationships in the Machining of Low-Carbon Steels of Different Sulphur Contents. F. W. Boulger, H. E. Hartner, W. T. Lankford, and T. M. Garvey. *ASME, Transactions*, v. 79, July 1957, p. 1155-1164.

Tests on steels with 0.025 to 0.250% S content in constant-pressure and conventional lathes showed that S addition reduced the forces acting on the tool for equivalent feeds. This effect results from decreased friction between chip and tool and from an accompanying reduction in strain during chip formation.

15131 Leaded Steel and the Real Area of Contact in Metal Cutting. M. C. Shaw, P. A. Smith, N. H. Cook, and E. G. Loewen. *ASME, Transactions*, v. 79, July 1957, p. 1165-1171.

The real area of contact between chip and tool is between 1 and 2% of the apparent area of contact. The cutting characteristics of steel containing Pb are compared with those for steel without Pb as well as those for pure Pb.

15132 Cutting-Fluid Evaluation. H. W. Husa. *ASME, Transactions*, v. 79, July 1957, p. 1172-1176.

Transfer of radioactive material from a cutting tool to the chips produced in facing the end of a steel tube is used as a means of measuring tool-wear rate. In addition to this, evaluation of a cutting oil may require consideration of the roughness of the cut surface or the cutting temperature.

15133* Swaging. *Automatic Machining*, v. 18, July 1957, p. 31-35.

How and when to use swaging, an inexpensive process which can save both time and material in tapering, reducing, forming, and assembly.

15134* Hole Finishing. Stuart George. *Automatic Machining*, v. 18, July 1957, p. 36-38.

Techniques to meet tighter specifications can avoid the need for secondary operations.

15135* Stainless Steel. III. Reaming and Tapping. J. A. Ferree. *Automatic Machining*, v. 18, July 1957, p. 42 + 4 pages.

Equipment and procedures.

15136 Prevention of Flakes in Semi-Finished Steels. L. A. Narutskaya, S. V. Gubert, and D. M. Rabinovich. *Henry Brutcher Translation No.* 3908, 5 p. + 1 plate. (From *Stal'*, v. 16, no. 12, 1956, p. 1097-1098.) Henry Brutcher, Altadena, Calif.

Precautions taken in rolling mills to prevent flake formation. Recommended cooling practices.

15137 Constant Surface Cutting Speed Saves Time and Tools. A. S. Albrecht. *Iron Age*, v. 180, July 18, 1957, p. 124-126.

Data shows how cutting speed affects tool life, resulting finish, and accuracy.

15138 How to Get More for Your Metalworking Dollar. Machining Ferrous Metals. *Iron Age*, v. 180, July 25, 1957, p. 113-128.

Gives pointers for achieving the highest quality consistent with lowest price. In machining stainless steels, use of a really effective coolant is most important because of the high heat developed. Moderate feeds and cutting speeds give best efficiency. In drilling, the chuck, drill shank, and work must be kept clean and free of chips. In tapping, avoid broken taps and plugged holes by tapping in two operations whenever necessary. Start with an undersize tap. Turning speeds, cutting speeds, and rates of feed are tabulated for stainless steels and various standard steels.

15139 Selection and Economy of Equipment for Blooming and Slabbing Mills. Kurt Schlesinger. *Iron and Steel Engineer*, v. 34, July 1957, p. 63-74.

15140 Electrical Features of a Hot Strip Reversing Rougher With Close Coupled Edger. J. H. Greiner and A. Mozina. *Iron and Steel Engineer*, v. 34, July 1957, p. 88-93.

15141* (Russian.) Kinetics of Drawing Process. **Kinetika protsessa vytiagivaniia. II.** A. N. Gerasimov. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk*, no. 5, May 1957, p. 56-61.

Theoretical study of systematic or incidental deviation from the stationary process.

15142 Blister Formation in Rolled Aluminum. J. H. O'Dette. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, July 1957, p. 924-929.

Blister raising discontinuities were located in sheet ingots and followed by means of nondestructive testing methods through the various stages of sheet production to the formation of blisters. The relative importance of gas content and ingot discontinuities was determined. Use of a fabricating technique based on at least 40% cold reduction of the as-cast ingot prior to the application of normal hot and cold rolling procedures is shown to eliminate blisters.

15143 Industrial Honing. V. D. Warburton-Brown. *Machinery Lloyd (Overseas Ed.)*, v. 29, June 22, 1957, p. 70-77.

Equipment; the nature of machined surfaces; correction of errors by honing; bell mouthing; effect of surface interruptions; blind bores; external honing; field of application.

15144 The Production of Master Gears. Martin A. Hartman. *Machinery (London)*, v. 90, June 28, 1957, p. 1448-1453.

Types of master gears; materials; types of gear blanks; heat treatment; forming the gear teeth; inspection; suggested tolerances.

15145 The Machinability Concept. K. G. Lewis. *Metal Treatment and Drop Forging*, v. 24, July 1957, p. 263-271.

Methods of evaluating machinability; tool force and power consumption considerations; machining and material variables. (To be continued.)

15146* Continuous-Dress Grinding. Anderson Ashburn. *Metalworking Production*, v. 101, June 28, 1957, p. 1106-1108.

Key to process is a form cutter for grinding wheels containing cemented diamond particles in a powder-metal body. The cutter is used in a set-up to provide continuous or cycle dressing to provide "perpetual form control".

15147* Air-Gauging Gives Auto-Selective Honing. *Metalworking Production*, v. 101, June 28, 1957, p. 1109-1110.

Individual bore sizes can be adjusted to meet the specific tolerances.

15148* Metalworking by Spark-Erosion. II. W. Ullmann. *Metalworking Production*, v. 101, June 28, 1957, p. 1117-1121.

Examples of work done by the process.

15149 Hot Finish-Forming Ti. J. L. Bayer and W. W. Wood. *Product Engineering*, v. 28, July 1957, p. 146-149.

New technique based on electrically heated dies yields finished parts with zero springback in ½ to 3 min.

15150 (French.) The Mechanics of Metal Cutting. **La mécanisme de la coupe des métaux.** Roger Jouty. *Publications Scientifiques et Techniques du Ministère de l'Air*, no. 326, 1957, 98 p. (TL502 F84.1p Vis.)

Mechanism of chip formation. Part played by the sliding and rubbing between the chip and the face of attack. Tests with a two-component dynamometric tool holder. Increase of temperature. Deformation and friction energies. Tool vibrations.

15151 The Prediction of the Cupping Properties of Sheet Metals by the Use of Ultimate Tensile Strength. Emerson N. Ludington. *Sheet Metal Industries*, v. 34, July 1957, p. 485-490.

Relationships between stresses and resulting strains while making a formed object from a flat sheet.

15152 (German.) Temperature Measurements in the Drawing of Steel Wire. **Temperaturmessungen beim Ziehen von Stahldraht. II.** Werner Leug and Karl-Heinz Treptow. *Stahl und Eisen*, v. 77, June 27, 1957, p. 859-867.

Effect of lubricants, wire composition, and processing variables on temperature.

15153 (German.) Investigations on a Four-High Reversing Mill Stand Rolling Cold Strip for Tinplate. **Untersuchungen an einem Vierwalzen-Kaltband-Umkehrgerüst für Weissblech. I.** Measurements to Determine the Power and Work Required and the Degree of Utilization. **Messungen zur Bestimmung des Kraft- und Arbeitsbedarfes und des Ausnutzungsgrades.** Karl Heinz Spiller. **II.** Effect of the Rolling Force, Rolling Speed, Strip Tension and Amount of Lubricants Used on the Trueness to Dimensions of the Cold-Rolled Strip. **Einfluss von Walzkraft, Walzgeschwindigkeit, Bandzug und Schmierstoffmenge auf die Masshaltigkeit des kaltgewalzten Bandes.** Paul Funke. *Stahl und Eisen*, v. 77, June 27, 1957, p. 867-881.

15154* (Russian.) Improvement of the High-Chromium Steel Sheet Production Process. **Uluchshenie tekhnologii proizvodstva vysokokhromistogo tolstogo lista.** A. A. Babakov, T. A. Zhadan, V. A. Danilin, S. F. Bakuma, K. I. Antipov, M. N. Kul'kova, and S. Z. Kupriakhina. *Stal'*, v. 17, June 1957, p. 555-559.

Development of special rolling and heat-treating regimes achieved an improvement of the X25T and X28 steel sheet production process.

15155 Tool Steels. III. Selection of Tool Materials for Cold Working Operations. L. F. Spencer. *Steel Processing and Conversion*, v. 43, July 1957, p. 372 + 9 pages.

Tool-steel types for specific applications are analyzed.

15156 Technical Manual on the Machining of Thermenol. *U. S. Department of Commerce, Office of Technical Services*, PB 121660, Feb. 1956, 23 p. (T21 Un3R Contin.)

Basic information necessary for the machining of Thermenol by the usual processes and methods in use in industry today to produce "normal" or commercial finishes.

15157* (Russian.) Anti-Seizing Lubrication for Drawing Steel Items. **Protivozadirnaia smazka dlia vytiazhki stal'nykh izdelii.** S. A. Valiev. *Vestnik Mashinostroeniia*, v. 37, June 1957, p. 38-39.

Requirements and description of a new lubricant based on $Fe(OH)_3$.

15158* (German.) Roll Finishing, a Noncutting Finishing Process. **Das Glattwalzen, ein spanloses Verfahren der Feinbearbeitung.** Helmut König. *Zeitschrift für Metallkunde*, v. 48, June 1957, p. 366-370.

The practical application of a smooth rolling technique with reference to deformation processes in the surface. Changes in surface hardness, internal stresses, and surface roughness limit applicability.

See also: **14019** (integral skin milling); **14136** (furnace refractories); **14155** (oxide cutting tools); **14156** (grinding wheels); **14575** (automatic control systems); **14586** (electric motors for machine tools); **14602** (rolling mill rectifiers); **15229** (fabrication of uranium); **15233** (fabrication of uranium); **15320** (fabrication of Zircaloy); **15528** (tool life).

METALS—METALLOGRAPHY, TRANSFORMATIONS, AND STRUCTURES

15159 Angular Bends in Whiskers. G. S. Baker. *Acta Metallurgica*, v. 5, July 1957, p. 353-357.

The distributions of angular bends formed during growth in Zn, Cd, and Sn whiskers were measured. For spontaneous growth whiskers from electroplated surfaces, the distributions had peaks at angles equal to the angles between low-indice directions in the crystal lattice. Various characteristic groupings of angles could also be related to groups of low-indice directions.

15160 Dislocation Energy as a Driving Force for Boundary Migration. C. G. Dunn and K. T. Aust. *Acta Metallurgica*, v. 5, July 1957, p. 368-370.

A bicrystal sheet specimen of Si-Fe (3¼% Si) was cold-rolled 2½% and then annealed at 1200 C for various time-intervals. The grain boundary initially moved away from its center of curvature, but with continued annealing the direction of boundary migration was reversed. An estimate of 42,000 ergs/cm.^{2} was obtained for the difference in free-energy density across the boundary when the net driving force was zero. This estimate, together with the measured difference in dislocation density across the boundary, gave a value of 14×10^{-4} ergs/cm. for the energy of a single dislocation, which is in agreement with values reported in the literature. The results suggest a suitable method of experimentally determining the variation of energy of a single dislocation with density and distribution of dislocations.

15161 The Annealing of Point Defects in Cold-Worked Molybdenum. D. G. Martin. *Acta Metallurgica*, v. 5, July 1957, p. 371-376.

The change in electrical resistance on annealing was studied. It is proposed that a point defect, produced by cold-work, anneals at 150 C with an energy of migration of 1.26 ± 0.04 e.v., but other more complex processes anneal simultaneously.

15162 Observations on the Dislocation Structure of Germanium Crystals. W. G. Pfann and F. L. Vogel, Jr. *Acta Metallurgica*, v. 5, July 1957, p. 377-384.

Etch-pits are found both generally dispersed and in low angle boundaries. The boundaries tend to lie in (110) planes parallel to the growth direction and are comprised of edge dislocations.

15163 Theory of Precipitation Hardening. Isotropically-Strained System. R. O. William. *Acta Metallurgica*, v. 5, July 1957, p. 385-392.

Calculations to show that appreciable strengthening can result from the hydrostatic interaction between edge dislocations and isotropically strained matrix and precipitate resulting from a certain type of precipitation. This theory seems adequate to explain the strengthening observed on precipitation in the Fe-Cr system.

15164 The Shape of Carbide Precipitate Particles in α-Iron. R. H. Doremus. *Acta Metallurgica*, v. 5, July 1957, p. 393-397.

For annealing temperatures of over 100 C the carbide particles form as platelets spaced along the dislocation lines in the Fe and become more spherical as they grow.

15165* (German.) Effect of Traces of Impurities on the Secondary Recrystallization of Tungsten Wires. **Der Einfluss von Fremdsubstanzspuren auf die sekundäre Rekristallisation von Wolframdrähten.** T. Millner, J. Prohászka, and A. Horváth. *Acta Technica Academiae Scientiarum Hungaricae*, v. 17, nos. 3-4, 1957, p. 289-304.

The crystal growth during recrystallization of processed W wires having a fibrous structure was observed by means of the Robinson method.

15166* (German.) Effect of Chemical Composition and Structure on Hydrogen Behavior in Iron and Steel. **Einfluss der chemischen Zusammensetzung und des Gefügeaufbaus auf das Wasserstoffverhalten in Eisen und Stahl. I.** Effect of Silicon, Carbon, and Cementite and of Structural Composition on the Behavior of Hydrogen in Unalloyed Steels. **Einfluss von Silizium, Kohlenstoff und Zementit sowie der Gefügeausbildung auf das Verhalten des Wasserstoffs in**

unlegierten Stählen. Friedrich Erdmann-Jesnitzer and Hans Sabath. *Archiv für das Eisenhüttenwesen*, v. 28, May-June 1957, p. 345-353.

Absorption, emission, and diffusion of H in arc welding and weld metal. (To be continued.)

15167 An Investigation of Uranium Solid Solubility in Thorium. Arthur A. Bauer, Frank A. Rough, and Ronald F. Dickerson. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-1188, May 1957, 10 p. (UF767 U3b Contin.)

On the basis of electrical resistivity and X-ray diffraction data, solubility of U in Th lies between 1.5 and 2 w/o U at 1000 C and between 0.5 and 1 w/o U at 800 and 900 C. At temperatures below 800 C solubility is less than 1 w/o U.

15168 Rapid Method of Bringing Out the Primary Structure of Welds. A. A. Rossoshinskii. *Henry Brutcher Translation No.* 3936, 4 p. + 1 plate. (From *Zavodskaya Laboratoriia*, v. 22, no. 5, 1956, p. 558-560.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 11536, v. 5, May 1956.

15169* (French.) A Study of Recrystallization of Al Single Crystals After Plastic Deformation. **Étude de la recristallisation de monocristaux d'aluminium après déformation plastique.** Jean Montuelle. *Comptes Rendus*, v. 244, June 12, 1957, p. 2923-2925.

Effects of cold working on 99.7% commercial Al.

15170* (French.) Effects of Variations in the Austenite Composition on the Annealing of Thermal Martensite in Steels With 18% Chromium and 2, 4, or 6% Nickel. **Influence des variations de composition de l'austénite sur les modalités du revenu de la martensite thermique dans les aciers à 18% de chrome et 2, 4 ou 6% de nickel.** Paul Bastien and Alain Sulmont. *Comptes Rendus*, v. 244, June 17, 1957, p. 3056-3059.

The displacement of point Ms was determined by means of a dilatometer and showed the consequences of the variations studied.

15171* (French.) A Micrographic Detection Method Very Sensitive to Hydrogen in α-Uranium. **Sur une méthode de détection micrographique très sensible de l'hydrogène dans l'uranium α.** André Robillard and Daniel Calais. *Comptes Rendus*, v. 245, July 1, 1957, p. 59-62.

Description of thermal treatment for detecting traces of H in α-U in the form of hydrides.

15172* (Russian.) On the Ni_3B Compound in Nickel-Boron Alloys. **O soedinenii Ni_3B v splavakh nikel'-bor.** N. I. Blok, M. N. Kozlova, N. F. Lashko, and K. Ia. Shpunt. *Doklady Akademii Nauk SSSR*, v. 113, Apr. 1, 1957, p. 811-812 + 1 plate.

Metallographic and chemical investigation of Ni-B cast alloy. Separation of Ni_3B.

15173* (Russian.) The Phases of the Tungsten-Boron System. **Fazy sistemy vol'fram-bor.** G. V. Samsonov. *Doklady Akademii Nauk SSSR*, v. 113, Apr. 21, 1957, p. 1299-1301.

X-ray, metallographic, and microhardness studies.

15174* (Russian.) Effect of Sulfur on the Solubility of Oxygen in Liquid Iron. **Vliianie sery na rastvorimost' kisloroda v zhidkom zheleze.** Z. Buzhek and A. Samarin. *Doklady Akademii Nauk SSSR*, v. 114, May 1, 1957, p. 97-98.

Tests conducted with liquid Fe at 1550 and 1600 C and containing $<0.01\%$ C, $<0.01\%$ Mn, 0.002% S, 0.01% P, and traces of Si showed no effect.

15175* (Russian.) Metallochemical Table of Chemical Elements. **Metallokhimicheskaia tablitsa khimicheskikh elementov.** I. I. Kornilov. *Doklady Akademii Nauk SSSR*, v. 114, May 1, 1957, p. 106-109.

The chemical elements were distributed into the following groups: metals forming constant or limited solid solutions, metalloids forming limited solid solutions or ionic compounds, and metals that do not react with the central part of the periodic system.

15176* **Microsectioning. A Metallographic Technique for Semiconductor Devices.** J. S. Hanson. *IBM, Journal of Research and Development*, v. 1, July 1957, p. 279-288.

Technique enables metallographic sectioning of fragile semiconductor devices without the difficulties and specimen damage associated with the use of conventional techniques. Major advantages are maintenance of a planar surface on specimens having adjoining areas of widely varying physical characteristics, preservation of boundary details between such areas by elimination of rounding-off effects, and precise positioning of the sectioning plane by direct micrometer caliper measurement.

15177 (French.) A Study of the Kinetics of Martensite Transformation and Austenite Stabilization. **Étude de la cinétique de la transformation martensitique et de la stabilisation de l'austénite.** C. Crussard and J. Philibert. *Institut de Recherches de la Sidérurgie, Publications*, ser. A, no. 156, Feb. 1957, 8 p. (Reprinted from *Revue de Métallurgie*, v. 53, Dec. 1956, p. 973-980.) (TN602 In7p Vis.)

As was revealed by transformation of hyper-eutectoid Cr steels and of ferronickel, the presence of C or N and some plastic deformations are necessary for the stabilization of austenite. The effect of C or N on decarburized or slightly carburized ferronickel was studied with further theoretical explanation.

15178* (Russian.) Phase Transformations of High Cr Alloys in the System Cr-Mo-Fe. **Fazovye prevrashcheniia v splavakh Cr-Mo-Fe, bogatykh chromom.** N. V. Ageev, L. N. Guseva, and K. P. Markovich. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk*, no. 4, Apr. 1957, p. 23-32.

Kinetics of phase transformations in Cr-base alloys containing Mo and Fe in amounts from 15 to 20%.

15179* (Russian.) Mechanism of Nodular Graphite Formation in Magnesium Cast Iron. **O mekhanizme obrazovaniia sharovidnogo grafita v magnievom chugune.** V. P. Pavlov. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk*, no. 4, Apr. 1957, p. 33-39.

Survey of theories of the mechanism of nodular graphite formation in cast iron; experimental checks on some of them.

15180 Partial Polygonization in Impure Copper Crystals. F. W. Young, Jr. and N. Cabrera. *Journal of Applied Physics*, v. 28, July 1957, p. 787-791.

A method to produce etch pits in OFHC Cu by electroetching is presented and used to show that "partial polygonization" occurs in OFHC Cu at or above 900 C.

15181 Space Group of Tellurium and Selenium. Robert H. Asendorf. *Journal of Chemical Physics*, v. 27, July 1957, p. 11-16.

A group theoretical analysis of the symmetry of the crystal structure and Brillouin zone of Te and Se. Character tables for the group of the wave vector are given for various points of the Brillouin zone.

15182 Calculation of Diffusion Coefficients by the Matano-Boltzmann Method. E. M. Baroody. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, July 1957, p. 819-822.

Some aspects of Boltzmann's solution for one-dimensional diffusion in an infinite medium when the initial distribution is a step function are clarified. The basis of the Matano-Boltzmann method for determining diffusion coefficients from concentration curves is discussed, and a new way of applying the method is derived and illustrated. The new procedure makes the judgment of the effect of errors in concentration measurements easier than do the graphical methods frequently used.

15183 Preferred Growth Direction of Metals. William A. Tiller. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, July 1957, p. 847-855.

Theory developed for face-centered-cubic metals predicts the direction of formation of boundaries between substructures and the occurrence of stray crystal formation as a function of the orientation of the solid-liquid interface and the degree of constitutional supercooling existing in the liquid.

15184 Aging in Complex Commercial Ni-Cr Alloys Hardened With Titanium and Aluminum. Robert F. Wilde and Nicholas J. Grant. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, July 1957, p. 865-873.

Air-melted Inconel X550, Inco 700, and a vacuum-melted M-252 and Waspaloy were studied in considerable detail for aging response. Identification of the γ' phase, Ni_3 (Al, Ti), was made in all but M-252. The effect of solution and aging treatments on the rupture life and ductility was determined by means of creep-rupture tests at 1500 and 1600 F.

15185 Diffusion in Gold and Au-Ag Alloys. H. W. Mead and C. E. Birchenall. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, July 1957, p. 874-877.

The self-diffusion coefficients of Au in pure Au and alloys of Au and Ag were measured over a range of temperatures. Chemical interdiffusion coefficients were measured on pure metal and incremental couples, but are of lower accuracy because of the development of porosity.

15186 Constitution of Delta-Phase Alloys of the System U-Zr-Ti. H. A. Saller, F. A. Rough, A. A. Bauer, and J. R. Doig. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, July 1957, p. 878-881.

The ternary section between the intermediate δ-phase alloys of the U-Zr and U-Ti systems was investigated and a constitutional diagram for the section, ranging from U-74 at.% Zr to U-35 at.% Ti proposed. No evidence for a three-phase region or a new phase, not found in the binary systems, was indicated. At elevated temperatures the three components exhibited complete solubility, to form the body-centered-cubic γ-phase, decomposing at about 560 C to the U-Zr and U-Ti δ-phases in an apparent eutectoid reaction.

15187 Preparation of Alpha Uranium Single Crystals by a Grain-Coarsening Method. E. S. Fisher. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, July 1957, p. 882-888.

15188 Elevated Temperature Phase Relationships in the Cr-Ni-Mn-N System. E. J. Whittenberger, E. R. Rosenow, and D. J. Carney. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, July 1957, p. 889-895.

Austenite-austenite plus δ ferrite phase boundaries were determined at temperatures of 2100, 2200, and 2300 F over the composition ranges 15 to 21% Cr, 0 to 3% Ni, 12 to 18% Mn, and 0.25 to 0.45% N.

15189 Intermetallic Compounds in Titanium-Hardened Alloys. H. J. Beattie, Jr. and W. C. Hagel. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, July 1957, p. 911-917.

Phase relationships in 26% Ni-15% Cr alloys of the A-286 type appear to result from the tendency of excess Ni to leave the matrix and combine with Al-poor γ',η, and G phases. Such depletion is controlled by time, temperature, and relative concentrations of Si, Ti, and Al.

15190 Hydrogen Distribution in Heat-Treated Titanium as Established by Autoradiography. O. J. Huber, J. E. Gates, A. P. Young, M. Pobereskin, and P. D. Frost. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, July 1957, p. 918-923.

The duplex heat treatment of the two-phase Ti alloys containing relatively large amounts of β-stabilizing elements frequently produces a dark-etching phase at the grain boundaries. An investigation of this phase was conducted on a Ti alloy containing 3% Mn, 1% Fe, 1% Cr, 1% Mo and 1% V in the annealed and in the heat-treated condition. Autoradiography, using tritium as a tracer element and electron microscopy showed the intergranular phase to be a H-rich material.

15191 Diffusion of Magnesium, Silicon, and Molybdenum in Nickel. R. A. Swalin, Allan Martin, and R. Olson. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, July 1957, p. 936-939.

The activation energies obtained were close to that for self-diffusion in Ni with the exception of Mg, for which the value was about 10 kcal. per g-atom less.

15192* Crystal Growth in Chemical Displacement. A. Goswami. *Journal of Scientific & Industrial Research*, v. 16, sec. B, May 1957, p. 186-190.

The structures of metallic deposits obtained by chemical displacement on single crystal substrates such as Cu (110), (100), (111), and Fe (100) faces were examined by electron diffraction, and compared with the structures of the corresponding cathodic deposits.

15193 Magnesium-Zirconium Diffusion Studies. L. S. DeLuca, H. T. Sumsion, and D. D. Van Horn. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission)*, KAPL-1746, Apr. 1957, 31 p. (UF767 Un3.1Ka Contin.)

The interdiffusion rates between Mg and Zr wer determined by metallographic methods for the temperature range of 500 to 640 C.

15194* (Dutch.) Carbide Precipitation in 304 E.L.C. **Carbideprecipitatie in 304 E.L.C.A.** A. Oolbekkink. *Metalen*, v. 12, July 15, 1957, p. 244-247.

In the 18-8 type steel examined, a C content of 0.03% is not sufficiently low to prevent carbide precipitation. When this steel is held for one hr. at a temperature of about 650 C and furnace cooled, enough carbides are precipitated to seriously impair corrosion resistance. For welding however, the material has several advantages over the stabilized 18-8 types with higher C content (0.08%).

15195* (German.) Metallographic Development of Copper Materials by Microtome Shaving and Anodic Polishing. **Metallographische Gefügeentwicklung von Kupfer-Werkstoffen durch Überschneiden mit einem Mikrotom und anodisches Wischpolieren.** G. Reinacher. *Metall*, v. 11, July 1957, p. 593-598.

Applicability and advantages of described process for metallographic preparation of various Cu materials and alloys over previous methods.

15196* (Russian.) Nature of the Martensite Transformation. **K voprosu o prirode martensitnogo prevrashcheniia.** M. E. Blanter and P. V. Novichkov. *Metallovedenie i Obrabotka Metallov*, no. 6, June 1957, p. 11-14.

There is continuous modification of the matrix phase (austenite) during martensitic transformation. Resistance to this is increased by cold hardening, temperature decrease, or deformation.

15197 Occurrence of the Beta-Manganese Structure in Transition Metal Alloys and Some Observations on Chi-Phase Equilibria. H. J. Goldschmidt. *Metallurgia*, v. 56, July 1957, p. 17-26.

A compound isomorphous with β-Mn exists in the Fe-Cr W-C system; it is stable only above 1350 C but can be retained by water-quenching from 1400 C. This π phase is a high-temperature form of χ-phase, the α-Mn isomorph, but the composition and solubility region of χ and π do not necessarily coincide. Lattice-spacings of π phase vary with composition, ranging from 6.27 to 6.39 kX. The two types of Mn-atom known from Preston's β-Mn structure will, in π, provide sites predisposed to filling by either (Cr, W) or (Cr, Fe) atoms differentially. The structure contains sufficient holes to permit some interstitial carbon. Wide variations in the lattice-spacings of χ and ϵ reflect solubility variations, and (together with those in π) probable age-hardenability over successive high-temperature ranges; potentially this might favor creep resistance. Carbon-free χ (Fe-Cr-Mo) and χ (Fe, Cr-W) are located in both systems between the σ- and ϵ-phase fields. Carbon-free χ-phase forms assemblies with σ-, N α-, and γ-phases and such sequences can be systematically produced by varying composition, temperature, or time at temperature. χ-phase and η-carbide form alternative compounds at a constant-carbon level in the Fe-Cr-W-C system, depending on Cr content, and a steady transition occurs from η-bearing high-speed steel type to χ-bearing constitutions.

15198 Grain-Boundary Carbides in Extra-Low-Carbon Stainless. R. O. Steiner and P. S. Trozzo. *Metal Progress*, v. 72, July 1957, p. 108-110.

A "sensitizing" heat treatment precipitates complex carbides, $(Fe, Cr)_{23}C_6$, whose locus favors one of the abutting grains.

15199 Solid State Physics Semiannual Progress Report, July-December, 1956. John E. Hove. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-1885, June 1957, 40 p. (UF767 Un3.1na Contin.)

A brief description is given of the results to date of a metallurgical study of the Th-rich end of the Th-U phase diagram.

15200 Germinative Grain Growth Characteristics of Zirconium. J. C. Bokros. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-1926, June 1957, 26 p. (UF767 Un3.1na Contin.)

Above 950 F, Zr which has been strained a critical amount will experience germinative grain growth during recrystallization. Critical strains were determined as a function of annealing temperature and temperature of strain. Grain size as a function of prior plastic deformation was also determined.

15201 Diffusion Characteristics of Thorium and Aluminum. J. A. Milko. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-1774, Dec. 1954, 36 p. (UF767 U3o Contin.)

15202* (English.) **Fine Structures of X-Ray Absorption Spectra of Cobalt in the Face Centered Cubic Lattice and Close-Packed Hexagonal Lattice.** Masao Sawada, Kenjiro Tsutsumi, and Akira Hayase. *Physical Society of Japan, Journal*, v. 12, June 1957, p. 628-636.

15203* (English.) **Variation of Electron Diffraction Intensity With Crystal Size.** Shigeya Kuwabara. *Physical Society of Japan, Journal*, v. 12, June 1957, p. 637-643.

Intensity of electron diffraction Debye-Scherrer rings was studied for evaporated films of Al, Ag, Au, NaCl, KCl, and MgO of various thicknesses and crystal sizes. The observed intensity deviates from the value calculated by the kinematical theory of diffraction at crystal sizes less than 100 A for all the materials examined.

15204* (French.) Diffraction Chamber for the Irradiation of Chromium. **Chambre de diffraction pour le rayonnement du chrome.** F. Sebilleau. *Recherche Aéronautique*, no. 59, July-Aug. 1957, p. 33-37.

Description of X-ray diffraction chamber for testing steels and alloys containing Cr and Co. Optics of the process. Advantages of reflection over transmission methods.

15205 Dislocations and Stacking Faults in Stainless Steel. M. J. Whelan, P. B. Hirsch, R. W. Horne, and W. Bollmann. *Royal Society, Proceedings*, v. 240, ser. A, July 16, 1957, p. 524-538 + 12 plates.

Experiments with transmission electron microscopy show clearly that the dislocations in stainless steel can split into partial dislocations, and the existence of such partials and of stacking faults in face-centered cubic metal is confirmed. The stacking-fault energy is found to be low, and the properties of the dislocations and of the metal are as expected from a metal of low stacking-fault energy. Extensive annealing twins are found with (111) or (110) contact planes. No cross-slip is observed except at twin boundaries. The dislocations occur mainly in pile-ups or irregular forests. No regular polygonized structures are observed; irregular networks occur but these appear to be the result of the difficulty of dislocations crossing each other. Wide stacking faults occur at sufficiently high stresses. These observations are in contrast to those made on Al, a metal of high stacking-fault energy.

15206* (Russian.) The Influence of Alloying Components on the Content of Hydrogen and Its Mobility in Steel. **Vliianie legiruiushchikh elementov na soderzhanie i podvizhnost' vodoroda v stali.** Iu. A. Kliachko and T. A. Izmanova. *Stal'*, v. 17, June 1957, p. 507-511.

Alloying reduces mobility.

15207* (Russian.) Microstructure of Aluminum Containing Various Amounts of Silicon and Iron. **Mikrostruktura aliuminiia pri razlichnom soderzhanii kremniia i zheleza.** G. M. Korob'ev and N. V. Kharlamova. *Tsvetnye Metally*, v. 30, June 1957, p. 48-52.

In the absence of Si, the hypoeutectic alloys have a very fine eutectic structure. The excess iron phase precipitates in the form of coarse, acicular crystals only in hypereutectic alloys.

15208* (Russian.) Application of Electronographic Method in Investigation of Oxide Films on the Surface of Hard Alloys. **Primenenie elektronograficheskogo metoda dlia issledovaniia okisnykh plenok na poverkhnosti tverdykh splavov.** *Zavodskaia Laboratoriia*, v. 23, June 1957, p. 699-701.

Structure of oxide films on hard alloys.

15209* (English.) **The Crystallography of Eucairite, CuAgSe.** A. J. Frueh, Jr., G. K. Czamanske, and Ch. Knight. *Zeitschrift für Kristallographie*, v. 108, nos. 5-6, June 1957, p. 389-396.

Eucairite crystallizes as pseudo-tetragonal orthorhombic crystals. The true cell or supercell is a stacked sequence of subcells in two orientations. At 190-195 C there is an inversion to a high temperature modification.

15210* (German.) The Titanium-Vanadium-Zinc Ternary System. **Das Dreistoffsystem Titan-Vanadin-Zinn.** Werner Köster and Karl Haug. *Zeitschrift für Metallkunde*, v. 48, June 1957, p. 327-330.

Microscopic and X-ray study of system up to 50% Sn and isothermal sections for 700, 900, and 1100 C.

15211* (German.) The Titanium-Silver-Aluminum Ternary System. **Das Dreistoffsystem Titan-Silber-Aluminium.** Werner Köster and Armando Sampaio. *Zeitschrift für Metallkunde*, v. 48, June 1957, p. 331-334.

Microscopic and X-ray study. Isothermal sections at 800, 1000, 1100, and 1200 C.

15212* (Russian.) Investigation Into the Phase Diagram of the System Zirconium-Boron. **K issledovaniiu fazovoi diagrammy sistemy tsirkonii-Bor. I.** On the Formation of a Solid Solution of Boron in Zirconium. **Ob obrazovanii tverdogo rastvora bora v tsirkonii.** V. A. Epel'baum and M. A. Gurevich. *Zhurnal Fizicheskoi Khimii*, v. 31, Mar. 1957, p. 708-711 + 1 plate.

Zirconium dissolves up to 2 at.% of B with a corresponding change in lattice parameters.

15213* (Russian.) Velocity of Conversion of the α-Solid Solution Into the σ-Phase in Fe-Cr-V System. **O skorosti prevrashcheniia α-tverdogo rastvora v σ-fazu v sisteme Fe-Cr-V.** I. I. Kornilov and N. M. Matveeva. *Zhurnal Neorganicheskoi Khimii*, v. 2, June 1957, p. 1383-1391.

See also: **14209** (diffusion of Kr in Ag); **14539** (structure of vapor-deposited coatings); **14542** (structure of sulfurized steel); **14877** (examination of crystal sections); **15065** (crystal faults in metals); **15092** (hydrogen diffusion in steels); **15096** (structure of Ge); **15099** (phase transformations in La, Ce, Pr, and Nd); **15101** (diffusion in Al); **15112** (grain boundary damage in steel); **15121** (structure of high-speed steel); **15123** (structure of Al-Fe-Mn bronzes); **15125** (structure of ferritic steels); **15280** (radiation damage).

METALS—POWDER

15214 Preparation of Spherical Uranium Powder by Reduction of Uranium Trioxide With Calcium. A. P. Beard and F. K. Heumann. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission)*, KAPL-1380(Del.), July 1955, 32 p. (UF767 Un3.1ka Contin.)

The reduction of UO_3 with Ca metal in a bomb, at elevated temperatures. Yields of metal are high (90 to 95%) and 50% of the pellets are larger than 325 mesh (43 μ).

15215 Fawcett 3,000-Ton Hydraulic Metal Powder Press. *Machinery (London)*, v. 91, July 5, 1957, p. 16-21.

Press design and construction; control system.

15216 New Horizons in Powder Metallurgy. Cord H. Sump. *Metal Progress*, v. 72, July 1957, p. 95 + 3 pages.

Production of Ni and Cu powders from low-grade raw materials; compacting of powder between rolls into strip; manufacture of felts from metallic fibers; rapid sintering activated by volatile salts in the compact.

NONDESTRUCTIVE TESTING AND QUALITY CONTROL

15217 Fluoroscopy With an Enlarged Image. R. Halmshaw and C. Hunt. *British Journal of Applied Physics*, v. 8, July 1957, p. 282-288.

Comparisons of attainable sensitivity were made between two types of fluoroscopic set, one having an ultra-fine focus tube used with projective magnification and the other a conventional high current tube used with the specimen close to the screen.

15218 Practical Eddy Current Instruments With Encircling Test Coil for Quantitative Nondestructive Testing. IV. Theoretical and Experimental Foundations of Nondestructive Testing by Eddy-Current Methods. Friedrich Förster. *Henry Brutcher Translation No.* 3918, 23 p. + 1 plate. (From *Zeitschrift für Metallkunde*, v. 45, no. 4, 1954, p. 180-187.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 13245, v. 3, Sept. 1954.

15219 Testing Metals "On-the-Fly" With Eddy Currents. Richard Hochschild. *Control Engineering*, v. 4, Aug. 1957, p. 79-85.

Test techniques can provide a basis for checking and sometimes measuring, metallurgical and chemical properties such as strength and alloy composition.

15220* (Czech.) Basic Conception and Experimental Data With Ultrasound. **Základní pojmy a praktické příklady zkoušení ultrazvukem.** Vladimír Koblovský. *Hutník*, v. 7, June 1957, p. 191-197.

Physical aspects of ultrasonic waves. Basic conditions for testing materials by means of ultrasound, and experimental data on a large-section forging.

15221* (German.) Production Control With Nondestructive Inspection Methods. **Überwachung der Produktion mit Verfahren der zerstörungsfreien Prüfung.** H. Kostzewske. *Metall*, v. 11, July 1957, p. 582-586.

X-, γ-, and β-ray ultrasonic, eddy current, magnetic induction, and pneumatic (thickness measurement) methods for automatic production control.

15222* Gamma Radiography—Some Safety Points. Henry Allen. *Metalworking Production*, v. 101, June 28, 1957, p. 1124.

15223* A Selected Bibliography of Published References to Ultrasonic Non-Destructive Testing. H. L. R. Hinkley, compiler. 36 p. 1952. Great Britain Admiralty Centre for Scientific Information and Liason Library, London. (ZTA406.5 G79.1s Ref.)

A bibliography of 241 articles.

15224* (French.) Nondestructive Macrographic Examination of Annealing on Mild Steel Welds. **Contrôle du recuit des soudures sur acier par examen macrographique non destructif.** H. Granjon. *Soudage et Techniques Connexes*, v. 11, May-June 1957, p. 189-193.

Method for macrographic etching on the outside of fusion welded assemblies makes it possible to check efficiency of normalizing treatment.

NUCLEAR PHYSICS, NUCLEONICS, AND RADIATION

15225* (English.) **The Equations of Motion of Charged Particles in General Relativity.** Stanisław Bażański. *Acta Physica Polonica*, v. 15, no. 6, 1956, p. 363-379.

Derivation of equations.

15226 The Effect of Gamma Heating on the APPR-1 Pressure Vessel—New Design. H. R. Kroeger. *Advanced Scientific Techniques, Research Associates (U. S. Atomic Energy Commission)*, APAE-Memo-86, July 1956, 33 p. (UF767 Un3.1apa Contin.)

Reduction of the inside diameter of the vessel decreases the pressure stress, but results in a higher incident γ energy, and the resulting thermal stress increases.

15227 The Effect of Gamma Heating on the APPR-1 Pressure Shell. H. R. Kroeger, I. M. Neou, and J. L. Meem. *Advanced Scientific Techniques, Research Associates (U. S. Atomic Energy Commission)*, APAE-Memo-85, Sept. 1956, 222 p. (UF767 Un3.1apa Contin.)

Results of an extensive study on the problem of thermal stress in a reactor pressure vessel.

15228* (Russian.) Nuclear Reactions of High Energy π-Mesons in Lead. **Iadernye vzaimodeistviia πmezonov bol'shikh energii v svintse.** N. M. Kocharian, R. B. Begzhanov, and Kh. B. Pachadzhian. *Akademiia Nauk Armianskoi SSR*, v. 24, no. 4, 1957, p. 161-165.

Experimental study of π-mesons having energies up to 16 bev.

15229 The Fabrication of Uranium Clad Fuel Elements for the Fast Exponential Experiment. R. A. Noland and C. C. Stone. *Argonne National Laboratory (U. S. Atomic Energy Commission)*, ANL-5299, Oct. 1954, 41 p. (UF767 Un3.1an Contin.)

15230 Interstitial Compounds of Irradiated Graphite. G. R. Hennig and G. L. Montet. *Argonne National Laboratory (U. S. Atomic Energy Commission)*, ANL-5693, Mar. 1957, 30 p. (UF767 Un3.1an Contin.)

Attempts to prepare unordered compounds containing more than 1.5×10^{-3} acceptor per C atom by combined neutron irradiation and chemical treatment failed due to mutual destruction of the traps.

15231 Cross-Rod Matrices: Flow Friction Behavior and Recommended Thermal Design Data. James F. Matousek. *Argonne National Laboratory (U. S. Atomic Energy Commission)*, ANL-5590, Apr. 1957, 46 p. (UF767 Un3.1an Contin.)

Basic heat transfer and flow friction design data on crossed-rod matrices of interest as potential geometries for fuel elements for certain types of nuclear reactors are presented in graphical and non-dimensional forms.

15232 The EBWR, Experimental Boiling Water Reactor. *Argonne National Laboratory (U. S. Atomic Energy Commission)*, ANL 5607. May 1957, 232 p. (UF767 Un3.1an contin.)

Design, operation, and descriptions of components.

15233 The Fabrication of Certain Jacketed Uranium Helices. F. L. Yaggee. *Argonne National Laboratory (U. S. Atomic Energy Commission)*, ANL-5690, May 1957, 19 p. (UF767 Un3.1an Contin.)

15234 The Theoretical Physics of the Argonaut Reactor. Charles N. Kelber. *Argonne National Laboratory (U. S. Atomic Energy Commission)*, ANL-5710, May 1957, 50 p. (UF767 Un3.1an Contin.)

Composition and group constants; critical properties of an annulus, "two by six" loading, and one-and-two-sided loadings.

15235 Orifice-Metering Coefficients and Pipe Friction Factors for the Turbulent Flow of Lead-Bismuth Eutectic. H. A. Johnson, J. P. Hartnett, W. J. Clabaugh, and L. Fried. *ASME, Transactions*, v. 79, July 1957, p. 1079-1084.

15236 A Study of Serviceability and Safety in the Control System of the NRU Reactor. E. Siddall. *Atomic Energy of Canada Limited, Chalk River Project, Research and Development*, AECL no. 399, Nov. 1954, 41 p. (QC770 At71a Contin.)

15237* (Russian.) Experimental Fast-Neutron Reactor "BR-2". **Eksperimental'nyi reaktor na bystrykh neitronakh BR-2.** A. I. Leipunskii, et al. *Atomnaia Énergiia*, v. 2, June 1957, p. 497-500 + 1 plate.

Construction and operation of 150-kw. reactor using Pu fuel elements.

15238* (German.) Application of Radioactive Substances for the Removal of Electrostatic Charges. **Anwendung radioaktiver Substanzen zur Beseitigung elektrostatischer Aufladungen.** H. Haase. *Atomwirtschaft*, v. 2, June 1957, p. 186-188.

15239* The Range-Energy Relation for α-Recoil Atoms. D. L. Baulch and J. F. Duncan. *Australian Journal of Chemistry*, v. 10, May 1957, p. 112-127.

The ranges of ThC^{11} α-recoil atoms were redetermined at pressures of H, A, and air from 10^{-3} to 30 mm. by collection on a Ag plate mounted 3 mm. from a Pt source plate. Both the Flügge-Zimens recoil-range equation and the stopping power equation are shown to be unsatisfactory, but the recent Bohr formula is in much better agreement with the data.

15240* Fusion Reactors—Promising Nuclear Powerplants. Leo Seren. *Aviation Age*, v. 28, July 1957, p. 42 + 6 pages.

Nuclear propulsion for aircraft and missiles will progress beyond fission reactors and come into its own with the use of fusion reactors. Advantages of fusing atomic nuclei are greater safety and efficiency.

15241 Reactor and Plant Engineering. *Bettis Technical Review (U. S. Atomic Energy Commission)*, v. 1, May 1957, 205 p. (UF767 Un3.1wb Contin.)

Report on technology developed at the Bettis Plant of the Westinghouse Electric Corporation.

15242 The Time-Dependence of the Recording Properties of G5 Nuclear Emulsion. W. C. Barron and A. W. Wolfendale. *British Journal of Applied Physics*, v. 8, July 1957, p. 297-300.

The fading of fast proton and μ-meson tracks in G5 nuclear emulsion was studied as a function of time and conditions of storage. The mechanism responsible for fading appears to be the thermal ejection of electrons from the latent image.

15243 Radiation Damage Studies in Solids; Nuclear Resonance Absorption Technique. P. J. Bray. *Brown University, Department of Physics (U. S. Atomic Energy Commission)*, NYO-7623, Sept. 1956, 17 p. (UF767 U3ny Contin.)

Nuclear magnetic dipole resonance investigations were made of B_4C, KBF_4, $NaBH_4$, B_2O_3, and several glasses. Effects of the nuclear electrical quadrupole moment were noted, and the observed splittings of the NMR lines were correlated.

15244* (German.) Thermonuclear Reactions in Gas Discharge Plasmas. **Thermonukleare Reaktionen in Gasentladungsplasmen.** W. Rieder. *Elektrotechnik und Maschinenbau*, v. 74, June 15, 1957, p. 261-267.

Production of energy by means of thermonuclear reactions. Nuclear fusion processes. Advantages and difficulties of fusion reactors. The problems of containers and extreme temperatures.

15245* Gas Cooling in Power-Producing Nuclear Reactors. R. J. Beale. *Engineer*, v. 203, June 28, 1957, p. 974-976.

Merits and disadvantages of CO_2, He, H, and air as coolants.

15246 Radiation for Industrial Processing. R. Roberts. *Engineering*, v. 183, June 28, 1957, p. 802-804.

Potential large scale uses include food sterilization, insect control, sterilization of drugs and tissues, polymerization, and rubber vulcanization.

15247 Logarithmic and Linear Scintillation Exposure-Rate Meters With Sodium Iodide Crystals. W. G. Spear. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-47194, Apr. 1957, 32 p. (UF767 Un3.1hw Contin.)

A NaI crystal of 1 mm. thickness was utilized in the development of a portable scintillation exposure-rate meter to produce a maximum sensitivity of 0.05 mr. per hr. full scale with a drift rate of less than 3% of full scale per hr.

15248 (English.) **A Hyperon Model.** G. Wentzel. *Helvetica Physica Acta*, v. 30, nos. 2-3, 1957, p. 135-142.

Study of a nucleonic particle having three elementary states of neutron, proton, and lambda character, coupled with a *K*-meson field by Yukawa interactions. The binding of *K*-mesons gives rise to a spectrum of states which contains all levels of Gell-Mann's hyperon scheme.

15249 (English.) **Nuclear Levels and Shell Structure.** K. Bleuler and Ch. Terreaux. *Helvetica Physica Acta*, v. 30, nos. 2-3, 1957, p. 183-205.

Comparison of experimental data from all heavier odd neutron nuclei ($A > 30$) and corresponding results from the shell model.

15250* Inhibition of Shrinkage in Nuclear Emulsions. P. N. Krishnamoorthy. *Indian Academy of Sciences, Proceedings*, v. 45, sec. A, May 1957, p. 327-335.

Method consists of replacing the silver halide in the emulsion, which is removed during the fixing stage of the processing, by Canada balsam.

15251* (English.) **The Future for Nuclear Power.** Christopher Hinton. *IVA Tidskrift för Teknisk-Vetenskaplig Forskning*, v. 28, no. 4, 1957, p. 165-190.

Based on computations from data for the first Calder Hall plant.

15252 Low-Energy Elastic Scattering of Electrons by Oxygen and Nitrogen. P. Hammerling, W. W. Shine, and B. Kivel. *Journal of Applied Physics*, v. 28, July 1957, p. 760-764.

The elastic scattering of slow electrons is calculated by the method of phase shifts.

15253 Application of Luminescence Changes in Organic Solids to Dosimetry. James H. Schulman, Howard W. Etzel, and James G. Allard. *Journal of Applied Physics*, v. 28, July 1957, p. 792-795.

The degradation of photoluminescence in anthracene and naphthalene was studied under γ-ray and electron irradiation over the range 3×10^5 to 2×10^8 rep.

15254 Effects of Radiation Damping on Spin Dynamics. Stanley Bloom. *Journal of Applied Physics*, v. 28, July 1957, p. 800-805.

15255 Variational Calculation of the Nuclear Magnetic Shielding of the Proton. Bruce R. McGarvey. *Journal of Chemical Physics*, v. 27, July 1957, p. 68-74.

A variational method employing the unperturbed ground-state wave function for the molecule is used to calculate the shielding of the proton in the hydrogen and hydrogen halide molecules. Shielding depends on the ionic character of the bond, the bond distance, and the number of electrons on the atom to which the H is bonded.

15256 Orbits of Charged Particles in a Solenoid With Sinusoidal Current. J. W. Brault. *Los Alamos Scientific Laboratory (U. S. Atomic Energy Commission)*, LA-2080, June 1957, 41 p. (UF767 U3La Contin.)

Some orbits have been calculated numerically for charged particles in a magnetic field. The results are presented in such a way as to be useful even under conditions widely differing from those upon which the calculation was based.

15257 Pu^{239} Cross Sections and Their Temperature Dependence. Joseph Devaney, Max Goldstein, and Bertha Fagan. *Los Alamos Scientific Laboratory (U. S. Atomic Energy Commission)*, LA-2127, July 1957, 66 p. (UF767 U3La Contin.)

A single level Breit-Wigner analysis of Pu^{239} is folded into a Maxwell velocity distribution to obtain total, scattering, fission, and radiative capture cross sections vs. energy for neutron energies of 0.025 to 43 e.v., and for Pu^{239} temperatures of 0.0253 to 50 e.v.

15258* (German.) Principles and Instruments for the Measurement of Nuclear Radiation. **Messprinzipien und Messgeräte für Kernstrahlungen.** H. Peter. *Metall*, v. 11, July 1957, p. 586-593.

Optical and electrical methods; basic construction of instruments, detectors, amplifiers, and counting apparatus; instruments for the protection of people and the observation of spaces and objects.

15259* (German.) Equalization of Electrostatic Charges With an Ionized Air Current. **Ausgleichung elektrostatischer Ladungen mittelst ionisierten Luftstromes.** F. Běhounek. *Naturwissenschaften*, v. 44, no. 12, 1957, p. 347-348.

Charges appearing in various industrial processes are equalized by ions produced by radioactive radiation.

15260 A Conceptual Design of a Thorium-Uranium(233) Power Breeder Reactor. J. O. Henrie and E. F. Weisner. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-283, Feb. 1954, 33 p. (UF767 Un3.1na Contin.)

Design for sodium cooled, graphite moderated, thermal power-breeder reactor utilizing the Th-U^{233} breeding cycle appears feasible and will allow the production of economic power as well as full utilization of Th resources.

15261* The Isomeric Transitions in Tl^{197} and Tl^{195}. G. Andersson, P. A. Tove, B. Jung, and I. B. Svensson. *Nuclear Physics*, v. 3, June 1957, p. 493-505.

Internal conversion electrons from the isomeric transitions in Tl^{197} and Tl^{195} were studied in high resolution β-spectrometers. The half-lives of Tl^{197m} and Tl^{195m} were measured as 0.55 ± 0.10 sec. and 3.5 ± 0.4 sec. Pulse height spectra of the short-lived activities supported the mass assignments.

15262* Levels in Pb^{203} and Tl^{202} Populated From 3.62-h Pb^{202m}. J. A. McDonell, R. Stockendal, C. J. Herrlander, and I. Bergström. *Nuclear Physics*, v. 3, June 1957, p. 513-540.

Using β spectroscopic techniques, conversion electrons of transitions following the decay of 3.62-h Pb^{202m} were investigated.

15263* Isotopic Assignment of Slow Neutron Resonances in Germanium, Rubidium, Neodymium, and Tungsten. Eleanor M. Bowey. *Nuclear Physics*, v. 3, June 1957, p. 553-560.

The separated isotopes of the elements Ge, Rb, Nd, and W were studied, and the results are shown as γ-ray yield curves.

15264* Empirical Determinations of Nuclear Shape Factors and Moments of Inertia. E. D. Klema and R. K. Osborn. *Nuclear Physics*, v. 3, June 1957, p. 571-584.

Data on energies of the rotational levels of even nuclei, probabilities of electrodynamically-induced transitions between these levels, and quadrupole moments of odd-mass nuclei.

15265* Two-Component Theory of the Neutrino and K-Meson Decays Comprising Two Neutrinos. S. Oneda. *Nuclear Physics*, v. 3, June 1957, p. 598-605.

15266* Excited Levels in Bi^{206} From the Decay of Po^{206}. E. Arbman. *Nuclear Physics*, v. 3, July 1957, p. 625-643.

The energies and intensities of conversion electrons from the decay of Po^{206} were studied in a double focusing β-spectrometer. A decay scheme is proposed which contains 9 excited levels and includes 20 of the observed transitions.

15267* Dispersion Relations for the Decay of the τ-Meson. E. Corinaldesi. *Nuclear Physics*, v. 3, July 1957, p. 649-655.

The kinematics of the τ-meson decay is formulated so as to make possible the use of dispersion relations for the transition amplitude.

15268* The Low-Lying Energy Levels of ^{151}Eu. A. Bisi, E. Germagnoli, and L. Zappa. *Nuclear Physics*, v. 3, July 1957, p. 670-678.

The radioactive decay of Gd^{151} was investigated. Measurements of electron conversion spectrum and γ-spectrum show the existence of γ-rays accompanying the electron capture process. The energies of the γ-rays were found to be 21.3, 80, (144), 155, 176, 240, 299 k.e.v. A decay scheme is proposed.

15269* Electromagnetic Pumps for Reactors. W. B. Woollen. *Nuclear Power*, v. 2, July 1957, p. 267-276.

Description of both conduction and induction pumps.

15270* Mechanical Pumps and Circulators. F. L. Speed. *Nuclear Power*, v. 2, July 1957, p. 277-284.

Reviews the various types of mechanical pumps used for handling coolants and liquid fuels.

15271 Experimental Boiling Water Reactor. *Nucleonics*, v. 15, July 1957, p. 53-64 + 6 plates.

Characteristics; operating experience; significance; power costs; starting up procedures.

15272 Dynamics of the Homogeneous Reactor Test. Paul R. Kasten. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2072, June 1956, 142 p. (UF767 U30 Contin.)

Study to evaluate a specific reactor in terms of its safety and stability and to specify the conditions which will assure that the reactor system will have satisfactory operational characteristics.

15273 Chemical and Isotopic Studies of the Nitrox System for N^{15} Enrichment. G. M. Begun, L. L. Brown, L. B. Yeatts, N. C. Bradley, and E. F. Joseph. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2291, June 1957, 18 p. (UF767 U30 Contin.)

Use is made of the exchange reaction between HNO_3 and the oxides of N. The isotopic separation factor for the system varies from 1.064 at 1 *M* HNO_3 to 1.020 at 15.5 *M* HNO_3. A small, two-column enriching cascade was designed which produced gram quantities of highly enriched N^{15}.

15274 Radionuclides in Reactor Cooling Water—Identification, Source and Control. D. W. Moeller. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2311, June 1957, 161 p. (UF767 U30 Contin.)

15275 Studies of the Spherical Harmonics Method in Neutron Transport Theory. I. The Relation Between P_L- and Guass Quadrature Solutions of the Milne's Problem. Walter Kofink. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2334, June 1957, 56 p. (UF767 U30 Contin.)

The Gauss quadrature method and the spherical harmonics method of dealing with the monoenergetic transport equation are examined in detail.

15276 Production of $Xe^{131}m_2$. R. E. McHenry. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2289, July 1957, 3 p. (UF767 U30 Contin.)

Method for the production of large quantities of $Xe^{131}m_2$, where a high degree of purity is required, involves separating the $Xe^{131}m_2$ from the parent I^{131} and then purifying with Ca vapor.

15277 Radioisotope Production and Process Development Annual Report for 1956. H. E. Seagren. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2303, July 1957, 14 p. (UF767 U30 Contin.)

15278 Conference on Neutron Physics by Time-of-Flight Held at Gatlinburg, Tennessee, November 1 and 2, 1956. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2309, July 1957, 200 p. (UF767 U30 Contin.)

Thirty papers covering various new experimental results and the interpretation of resonance parameters, elastic and inelastic scattering, and fission.

15279 Local Thermal Flux Distribution in SPERT III Fuel Elements by the Spherical Harmonics Method. C. W. Reich. *Phillips Petroleum Co., Idaho Operations Office (U. S. Atomic Energy Commission)*, IDO-16327, Mar. 1957, 32 p. (UF767 Un3.1id Contin.)

15280 Radiation Damage Studies Program ETR Loop Materials Progress Report. M. S. Robinson. *Phillips Petroleum Co., Idaho Operations Office (U. S. Atomic Energy Commission)*, IDO-16337, Apr. 1957, 22 p. (UF767 Un3.1id Contin.)

Samples of Hastellov-X, Zircallov-2, 410 Stainless Steel, 2¼ Croloy, and Inconel-X were tested in the MTR hot cell.

15281 The SPERT III Reactor Facility Preliminary Design Report. T. R. Wilson. *Phillips Petroleum Co., Idaho Operations Office (U. S. Atomic Energy Commission)*, IDO-16341, May 1957, 31 p. (UF767 Un3.1id Contin.)

The reactor and primary coolant system are designed for operation up to 2500 psi. and 650 F. Coolant flow rates up to 20,000 gpm are provided with heat removal capacity sufficient for 60 Mw for approximately 30 min.

15282 The Production of Intense Cold Neutron Beams. I. Butterworth, P. A. Egelstaff, H. London, and F. J. Webb. *Philosophical Magazine*, v. 2, ser. 8, July 1957, p. 917-927.

It is possible and safe to use a low temperature moderator, placed in the core of a reactor, to enrich the flux of cold neutrons in a neutron beam. Liquid hydrogen, liquid hydrogen deuteride, and methane at 20 K were found to be effective moderators.

15283 (English.) **Perturbation Approach to the Fermi Gas Model of Heavy Nuclei.** N. M. Hugenholtz. *Physica*, v. 23, June 1957, p. 533-545.

15284 Inelastic Scattering of Slow Neutrons by Lattice Vibrations in Aluminum. R. S. Carter, H. Palevsky, and D. J. Hughes. *Physical Review*, v. 106, ser. 2, June 15, 1957, p. 1168-1174.

The lattice vibrations of Al were studied by means of the inelastic scattering of "cold" neutrons, in which the neutron absorbs a phonon whose energy is larger than the incident neutron energy. Dispersion curves, obtained for three different directions in the crystal, agree well with X-ray results and with theoretical calculations.

15285 Hyperfine Splitting in the $p^5\ ^2P_{1/2}$ Metastable State of I^{127}. Ryumyo Onaka. *Physical Review*, v. 106, ser. 2, June 15, 1957, p. 1178.

The hyperfine structure was investigated by means of a vacuum echelle spectrograph.

15286 Excitation of Metastable Levels in Helium Near Threshold. G. J. Schulz and R. E. Fox. *Physical Review*, v. 106, ser. 2, June 15, 1957, p. 1179-1181.

The excitation due to essentially monoenergetic electrons was obtained by using the retarding potential method. The metastables were detected by their emission of electrons from a Au-plated cylinder.

15287 Proton-Nucleus Elastic Scattering at 9.8 Mev. Norton M. Hintz. *Physical Review*, v. 106, ser. 2, June 15, 1957, p. 1201-1206.

The differential cross section for proton-nucleus elastic scattering was measured for Li, N, Al, A, Ni, Cu, Ag, Sn, and Au at a laboratory proton energy of 9.8 m.e.v. Data were taken at 5° intervals from 15 to 170° with an estimated standard deviation of 3 to 5%.

15288 Elastic Scattering of Alpha Particles With the Optical Model. W. B. Cheston and A. E. Glassgold. *Physical Review*, v. 106, ser. 2, June 15, 1957, p. 1215-1219.

The "blackness" of nuclear matter to α particles causes the scattering cross section to be insensitive to the real part of the α-particle-nucleus interaction.

15289 Measurement of the Longitudinal Polarization of Positrons Emitted by Sodium-22. Lorne A. Page and Milton Heinberg. *Physical Review*, v. 106, ser. 2, June 15, 1957, p. 1220-1224.

The connection between failure of parity conservation and polarization of betas from an unpolarized source is experimentally established.

15290 Decay Properties of Pu^{235}, Pu^{237}, and a New Isotope Pu^{233}. T. Darrah Thomas, Robert Vandenbosch, Richard A. Glass, and Glenn T. Seaborg. *Physical Review*, v. 106, ser. 2, June 15, 1957, p. 1228-1232.

15291 Diffractional Scattering of Fast Deuterons by Nuclei. A. I. Akhieser and A. G. Sitenko. *Physical Review*, v. 106, ser. 2, June 15, 1957, p. 1236-1246.

Expressions are found for the elastic scattering cross section for a deuteron, taking into account the semi-transparence of the nuclei.

15292 Cross Section for the $Be^9(n,\alpha)He^6$ Reaction. P. H. Stelson and E. C. Campbell. *Physical Review*, v. 106, ser. 2, June 15, 1957, p. 1252-1255.

The cross section was measured for neutron energies of 0.7 m.e.v. (threshold) to 4.4 m.e.v. and exhibited a smooth rise from less than 0.1 mb. at the expected threshold to a broad maximum of 104 ± 7 mb. at 3.0 m.e.v. followed by a gradual decrease to 70 mb. at 4.4 m.e.v.

15293 New Empirical Equation for Atomic Masses. Harris B. Levy. *Physical Review*, v. 106, ser. 2, June 15, 1957, p. 1265-1270.

Atomic masses calculated from this equation agree with experimental mass values to within ±0.5 millimass units in 75% of the 340 nuclides studied and agree to within ±1.5 millimass units in 95% of the nuclides. Beta-decay energies were calculated and checked against a total of 179 experimental values.

15294 Angular Distribution of 424-Mev Polarized Protons Elastically Scattered From Various Nuclei. Edvard Heiberg. *Physical Review*, v. 106, ser. 2, June 15, 1957, p. 1271-1279.

15295 Disintegration of Hyperfragments. O. Skjeggestad, S. O. Sörensen, and A. Solheim. *Physical Review*, v. 106, ser. 2, June 15, 1957, p. 1280-1285.

A very simple method for charge determination of short fragments emitted in nuclear disintegrations is described and applied to the identification of hyperfragments.

15296 Application of Dispersion Relations to Low-Energy Meson-Nucleon Scattering. G. F. Chew, M. L. Goldberger, F. E. Low, and Y. Nambu. *Physical Review*, v. 106, ser. 2, June 15, 1957, p. 1337-1344.

Relativistic dispersion relations are used to derive equations for low-energy *S*-, *P*-, and *D*-wave meson-nucleon scattering under the assumption that the (3,3) resonance dominates the dispersion integrals.

15297* (English.) **Elastic Scattering of 5.7 Mev Protons From Ni and Cu.** Minoru Takeda, Michiya Kondo, Syohei Kato, Chuin Hu, Ryuzo Nakasima, and Shotaro Yamabe. *Physical Society of Japan, Journal*, v. 12, June 1957, p. 561-564.

15298* The Scattering of High Energy μ-Mesons in Lead. J. L. Lloyd, E. Rössle, and A. W. Wolfendale. *Physical Society, Proceedings*, v. 70, no. 450A, June 1957, p. 421-432.

Experimental scattering distribution shows an excess of large displacements over the number expected on conventional scattering theory, indicating that the anomalous scattering found at low energies extends to these high energies.

15299 Hyperfine Structure in Manganese $^{55}/_{25}$ Mn. G. K. Woodgate and J. S. Martin. *Physical Society, Proceedings*, v. 70, no. 451A, July 1957, p. 485-488.

15300 Properties of the Hydrogen Molecular Ion. VII. Magnetic Dipole Oscillator Strengths of the $1s\sigma g$-$3d\pi g$ Transition. A. Dalgarno and R. McCarroll. *Physical Society, Proceedings*, v. 70, no. 451A, July 1957, p. 501-506.

15301 The Neon Flash Tube as a Detector of Ionizing Particles. M. Gardener, S. Kisdnasamy, E. Rössle, and A. W. Wolfendale. *Physical Society, Proceedings*, v. 70, no. 451B, July 1957, p. 687-699.

Particle detector consists of a glass tube filled with neon which, after traversal by an ionizing particle, can be made to glow by the application of a strong electric field.

15302* Average Energy of Allowed Beta-Particle Spectra. R. Loevinger. *Physics in Medicine and Biology*, v. 1, Apr. 1957, p. 330-339.

The average β-particle energy per disintegration was calculated relative to the maximum β-particle energy. A table of average β-particle energies is given for some of the radioisotopes of current medical and biological interest.

15303 What Does Thermal Efficiency Mean in Nuclear Power? *Power Engineering*, v. 61, July 1957, p. 63.

15304 Proceedings of the Shielding Symposium Held at the U. S. Naval Radiological Defense Laboratory, October 1956, 17-19. v. I. 266 p. 1957. U. S. Naval Radiological Defense Laboratory, San Francisco. (QC795 Un3.5p)

15305* The Photon-Nucleon Scattering. Shigeo Minami and Yoshio Yamaguchi. *Progress of Theoretical Physics*, v. 17, May 1957, p. 651-658.

The general expressions, the differential cross section, and the polarization of the recoil nucleon of the photon-nucleon scattering. Experimental data of the photon-nucleon scattering at high energies are analyzed in terms of the shadow scattering of the photo-pion production.

15306 Quantum Mechanics. H. A. Kramers. 496 p. 1957. Interscience Publishers, New York. (QC174.1 K86q)

An English translation of the well-known pre-war monograph.

15307 Boron-Loaded Liquid Scintillation Neutron Detectors. Lowell M. Bollinger and George E. Thomas. *Review of Scientific Instruments*, v. 28, July 1957, p. 489-496.

General construction problems; characteristics of particular counters successfully used in neutron transmission measurements by the time-of-flight method.

15308 High Resolution Neutron Velocity Spectrometer With Betatron Source. M. L. Yeater, E. R. Gaerttner, and G. C. Baldwin. *Review of Scientific Instruments*, v. 28, July 1957, p. 514-524.

An internal, thick U target is bombarded by 80 m.e.v. electrons when the betatron orbit is rapidly contracted, giving approximately 0.1 μ sec. bursts of neutrons at a 60-pps repetition rate with a peak intensity of about 7×10^{15} neutrons per sec. Measurements of total, capture, and fission cross sections are made with high-resolution detecting equipment located at points up to 20 meters from the target.

15309* (French.) Thermonuclear Reactions Induced by Discharge in Gases. **Sur les réactions thermonucléaires induites par la décharge dans les gaz.** Raymond Moch. *Revue générale des Sciences Pures et Appliquées*, v. 64, May-June 1957, p. 147-163.

General principles of the nuclear energy released by fusion; energy production in the sun; initiation and control of fusion reactions; specific energy production within the plasma.

15310 Energy Level in Rare-Earth Ions. J. P. Elliott, B. R. Judd, and W. A. Runciman. *Royal Society, Proceedings*, v. 240, ser. A, July 16, 1957, p. 509-523.

The tensor-operator and group-theoretical methods of Racah are used to examine the Coulomb interaction between electrons, spin-orbit coupling of the electrons, and the term arising from the influence of an external electrostatic field such as occurs when the rare-earth ion is situated in a crystal lattice.

15311* (German.) Materials Used in Building Reactors. **Werkstoff-Fragen beim Reaktorbau.** Erich Schmid and Karl Lintner. *Schweisstechnik*, v. 11, May 1957, p. 49-58.

Properties of U, Th, and Pu. Materials for moderators, reflectors, and structural components. Cooling systems. Survey of existing reactors.

15312 The Plasma Jet. Gabriel M. Giannini. *Scientific American*, v. 97, Aug. 1957, p. 80 + 6 pages.

Magnetohydrodynamic effects in an electric arc generate a beam of electrons and ions with a temperature of 30,000 F, the highest maintained beyond an instant by a man-made device.

15313* (Norwegian.) Magnetic Nuclear Spin Resonance. **Magnetisk kjernespinn-resonans.** O. Borgen. *Tidsskrift for Kjemi, Bergvesen og Metallurgi*, v. 17, no. 5, 1957, p. 68-72.

Theoretical basis; deflection of atomic rays inside and outside the electromagnetic field; energy absorption; forced nuclear precession. Experimental methods and new developments.

15314 Tables of Coulomb Phases and Amplitudes Taking Into Account the Finite Nuclear Size. L. A. Sliv and B. A. Volchok. *U. S. Atomic Energy Commission*, AEC-tr-2875, May 1957, 22 p. (UF767 Un3.1ae Contin.)

(Translated from the Russian by Rose V. Jermain.)

15315 Boiling and Flashing Reactor. Central Station Power Plant Design Study. W. N. McLean and M. N. Chiarottino. *U. S. Atomic Energy Commission, Research and Development Report*, NPG-111, Feb. 1955, 207 p. (UF767 Un3.1npg Contin.)

The principal features of a boiling type reactor and a flashing type reactor are combined in the design of this 180,000 net electrical kw. nuclear power plant.

15316 Neutron Emission Following μ-Meson Capture in Silver and Lead. Selig N. Kaplan. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3749, Apr. 1957, 52 p. (UF767 U3u Contin.)

15317* (Russian.) Unusual Particles. **Strannye chastitsy.** L. Okun'. *Uspekhi Fizicheskikh Nauk*, v. 61, Apr. 1957, p. 535-559.

General discussion of characteristics and reactions of π-mesons, *K*-mesons, hyperons, and other nuclear particles.

15318* (Russian.) Resonance Scattering of γ-Rays on Nuclei. **Resonansnoe rasseianie γ-luchei na iadrakh.** B. S. Dzhelepov. *Uspekhi Fizicheskikh Nauk*, v. 62, May 1957, p. 3-40.

Resonance excitation of nuclei by a continuous γ-spectrum. Effect of heating the source of radiation and mechanical movement of the latter.

15319* (German.) Atomic Structure of Matter. **Atomarer Bau der Materie.** Gerd Burkhardt. *VDI Zeitschrift*, v. 99, July 1957, p. 861-871.

Historical survey for engineers, of thought and discoveries in atomic physics, including Rutherford's concept of atomic structure and Einstein's law of mass and energy. (To be continued.)

15320 The Zircaloy-2 In-Pile Tube for the NRX Central Thimble. Richard M. Lieberman. *Westinghouse Electric Corporation, Atomic Power Division (U. S. Atomic Energy Commission)*, WAPD-TM-51, Apr. 1957, 122 p. (UF767 Un3.1wa Contin.)

The design, fabrication, and testing.

15321 Experimental and Theoretical Study of Critical Slabs. Effect of Absorbing Membranes of Cadmium, Gold, and Boron. A. D. Voorhis, T. M. Ryan, M. Goldsmith, and R. T. Jones. *Westinghouse Electric Corporation, Atomic Power Division (U. S. Atomic Energy Commission)*, WAPD-170, Apr. 1957. 43 p. (UF767 Un3.1wa Contin.)

A highly enriched slab core was bisected by absorbing membranes of Cd, Au, and B polyethylene. The data included critical core dimensions and activation traverses perpendicular to each membrane.

15322* (German.) Doubled Coulomb Stimulation in the Scattering of Nuclei by Nuclei. **Doppelte Coulomb-Anregung bei der Streuung von Kernen an Kernen.** W. Zickendraht. *Zeitschrift für Physik*, v. 148, no. 4, 1957, p. 533-550.

Collision of two heavy nuclei, and simultaneous stimulation of both via the electrostatic multipole reciprocal effect.

15323* (Russian.) Effect of Diffuseness of the Nuclear Boundary on Neutron Scattering. **Vliianie diffuznoi granitsy iadra na rasseianie neitronov.** V. N. Gribov. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, v. 32, Apr. 1957, p. 647-652.

Scattering amplitude for a potential with a diffuse boundary whose width is small can be expressed through the phase shifts for scattering on a rectangular potential of a smaller radius and three numerical parameters which determine the shape of the potential.

15324* (Russian.) Investigation of the Energy and Angular Distributions of π^0-Mesons Produced by 470 and 660 M.E.V. Protons on Carbon Nuclei. **Issledovanie energeticheskikh i uglovykh raspredelenii π^0-mesonov, obrazovannykh na iadrakh ngleroda protonami s energiei 470 i 660 MeV.** Iu. D. Baiukov, M. S. Kozodaev, and A. A. Tiapkin. *Zhurnal Eskperimental'noi i Teoreticheskoi Fiziki*, v. 32, Apr. 1957, p. 667-677.

Measurement of the energy spectra of γ-quanta from the decay of π^0-mesons produced by 660 m.e.v. protons on carbon nuclei.

15325* (Russian.) Production of Neutral π-Mesons by Neutrons on Deuterons and Complex Nuclei. **Obrazovanie neitral'nykh π-mezonov neitronami na deitone i slozhnykh iadrakh.** V. P. Dzhelepov, K. O. Oganesian, and V. B. Fliagin. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, v. 32, Apr. 1957, p. 678-681.

The yield of γ-quanta from the decay of π^0-mesons produced by 590 m.e.v. neutrons on deuterium was measured at an angle of 90° in the laboratory system.

15326* (Russian.) Internal Conversion Electron Spectrum of an Active Deposit of Radiothorium. **Spektr elektronov vnutrennei konversii aktivnogo osadka radiotoriia. II.** A. I. Zhernovoi, E. M. Krisiuk, G. D. Latyshev, A. S. Remennyi, A. G. Sergeev, and V. I. Fadeev. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, v. 32, Apr. 1957, p. 682-689.

Energies and relative intensities of the conversion lines were determined.

15327* (Russian.) π^0-Meson Production in *p-p* and *p-n* Collisions in the 390 to 660 M.E.V. Energy Range. **Obrazovanie π^0-mesonov v *p-p* i *p-n*- soudareniiakh v oblasti energii 390-660 MeV.** Iu. D. Prokoshkin and A. A. Tiapkin. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, v. 32, Apr. 1957, p. 750-766.

15328* (Russian.) Excitation of Rotational States in the Interaction Between Neutrons and Nuclei. **Vozbuzhdenie rotatsionnykh sostoianii pri vzaimodeistvii neitronov s iadrami.** V. N. Gribov. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, v. 32, Apr. 1957, p. 842-851.

Excitation by neutrons is studied in the energy range from the threshold up to 1.5 to 2 m.e.v.

15329* (Russian.) Theory of Cyclotron Resonance in Metals. **Teoriia tsiklotronnogo rezonansa v metallakh.** M. Ia. Azbel' and E. A. Kaner. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, v. 32, Apr. 1957, p. 896-914.

A new type of resonance is investigated which takes place in metals located in a H.F. electromagnetic field and a stationary magnetic field parallel to the surface of the metal. The shape of the resonance curve depends considerably on the electron dispersion law and permits determination of the topology of the Fermi surface.

See also: **14113** (radiobiology); **14171** (enrichment of U^{235}); **14231** (radioanalysis of liquids and gases); **14234** (determination of C and O isotopes); **14263** (determination of radio-nuclides); **14407** (neutrons in organic halogen atom reactions); **14487** (nuclear quadrupole coupling); **14579** (atomic-beam resonance curves); **14580** (reactor thermal transients); **14846** (nuclear power station); **14879** (multichannel time difference analyzer); **14881** (control of radiation in laboratories); **14883** (nuclear instrumentation); **14950** (liquid-metal technology); **14968** (molten metal hazards); **14983** (corrosion failure of the WAPD-30 loop in the MTR); **15437** (radioactive waste disposal); **15440** (forecasting of radioactive fallout); **15485** (irradiation of wood); **15510** (thermal radiation damage to cellulose).

OPERATIONS RESEARCH AND MANAGEMENT ENGINEERING

15330 Case Studies in Foreign Operations. 244 p. 1957. International Management Assn., New York. (HF1456 In8ca)

Overseas operations of some representative organizations. Papers dealing with international policy, licensing, industrial relations, and advertising.

15331 High-Speed Operations Research. Melvin E. Salveson. *Harvard Business Review*, v. 35, July-Aug. 1957, p. 89-99.

Use of high-speed computers in operations research make possible high-speed business planning.

15332* The Assignment Problem—A Special Case of Linear Programming. Richard E. Beckwith and Ram Vaswani. *Journal of Industrial Engineering*, v. 8, May-June 1957, p. 167-172.

The application of Flood's optimal assignment technique is illustrated.

15333 Management in Action. Tom Burns. *Operational Research Quarterly*, v. 8, June 1957, p. 45-60.

An interim report of some of the general and comparative results of a study made in eight firms of the way in which managers spend their time at work over a period of three, four, or five weeks.

15334* Linear Programming Isn't Always the Answer. David E. Debeau. *Operations Research Society of America, Journal*, v. 5, June 1957, p. 429-433.

Linear programming has been frequently applied to the problem of finding the best mix of raw material for a particular selection of products. In applications of this type where one or more of the raw materials is nonuniform, application of linear programming can increase the cost of operation. Calculation of charge for a metal melting furnace is discussed as an example.

See also: **14557** (computers for production control).

ORE AND MATERIALS BENEFICIATION

15335 Refining of Thorium by Solvent Extraction. R. A. Ewing, S. J. Kiehl, Jr., and A. E. Bearse. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-955, Oct. 1954, 70 p. (UF767 U3b Contin.)

Extractions up to 99.99+% were obtained by extraction of mantle-grade $Th(NO_3)_4$ with 30% TBP-70% Solvesso 100, using HNO_3 salting. Critical Th concentrations for phase separation were determined at 25 C for TBP-kerosene mixtures containing from 10 to 50% TBP.

15336 Material Handling in the Sinter Process. Martin Vander Laan. *Blast Furnace and Steel Plant*, v. 45, July 1957, p. 727-730.

A simplified flow chart of an actual installation is shown.

15337* Dry Concentration. C. K. G. Lamming. *Canadian Mining Journal*, v. 78, June 1957, p. 116-118.

Development of the main types of machine currently used in pneumatic concentration operations in desert areas.

15338* Separation of Manganese From Iron in Sedimentary Processes. Konrad B. Krauskopf. *Geochimica et Cosmochimica Acta*, v. 12, nos. 1-2, 1957, p. 61-84.

15339 Micrographic Study of Sulfide Roasting. P. G. Thornhill and L. M. Pidgeon. *Journal of Metals*, v. 9, sec. 1; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, July 1957, p. 989-995.

Calcines resulting from partial roasting of closely-sized sulfide particles were examined by micrographic, X-ray diffraction, and chemical methods. Changes in composition of residual sulfide kernels show that the roasting process involves preferential oxidation of metal atoms. This observed selectivity of oxidation permitted conclusions to be drawn respecting the mechanisms of the roasting reactions in their initial stages, and implied a mechanism whereby oxidation continues after it has ceased to be measurably selective. This reaction mechanism consists essentially of the growth of oxide films by cationic migration and their periodic disruption by built-up sulfur pressure at the sulfide-oxide interface, and many well be applicable to the roasting of all sulfides, including sphalerite, which is known to hold rigidly to its stoichiometric composition, and hence does not undergo the measurable changes observed in the other minerals on roasting.

15340* (Hungarian.) Fluidized Roasting of Zinc Concentrates. **A gyöngyösoroszi cinkszínporok fluidizáló pörkölése.** Győző Várhegyi and Béla Czeglédi. *Kohászati Lapok*, v. 12, Jan.-Feb. 1957, p. 57-65.

Experiments aiming at intensifying the roasting process.

15341* (Russian.) Intensification of the Process for Dehydrating Flotation Concentrates. **Puti intensifikatsii protsessa obezvozhivaniia flotokontsentrata.** M. I. Beilin. *Koks i Khimiia*, 1957, no. 6, p. 6-9.

Defective blowing system was responsible for poor results in concentration plants. Efficient and low-cost operation was furthered by improved blowing, by increasing the thickness and temperature of the pulp, and by using surface-active substances.

15342 Grinding Ball Rationing. Walter L. Crow. *Mining Engineering*, v. 9, July 1957, p. 750-752.

Determining the optimum size assortment of grinding balls for a makeup charge is a practical means of improving mill operation.

15343* Solvent Extraction at Climax Uranium Proves These Advantages. George O. Argall, Jr. *Mining World*, v. 19, July 1957, p. 44 + 5 pages.

Nine specific advantages are cited. A glossary on solvent extraction is included.

15344 Status Report on Studies of Uranium-Aluminum Alloy Dissolution to a DIBAN Dissolver Product. R. L. Andelin, F. H. Tingey, and C. M. Slansky. *Phillips Petroleum Co., Idaho Operations Office (U. S. Atomic Energy Commission)*, IDO-14407, June 1957, 45 p. (UF767 Un3.1id Contin.)

A series of statistically designed, batch dissolution experiments was conducted with Al-U fuel elements to determine their optimum dissolution rate in HNO_3 with Hg and fluoride catalysts, to an acid-deficient dissolver product.

15345* Basic Principles of Uranium Plant Design. S. Craib and D. G. Maxwell. *South African Institute of Mining and Metallurgy, Journal*, v. 57, May 1957, p. 591-624.

15346 Purification of Thorium by Solvent Extraction. M. E. Whatley, Morton Smutz, and G. L. Bridger. *U. S. Atomic Energy Commission, Research and Development Report*, ISC-415, July 1953, 92 p. (UF767 Un3.1is Contin.)

Investigations were made of the solvent extraction of thorium nitrate with tributyl phosphate from aqueous solutions containing phosphate, sulfate, and nitric acid.

15347 A Process for Separating Thorium Compounds From Monazite Sands. Kernal Glenn Shaw, Morton Smutz, and G. L. Bridger. *U. S. Atomic Energy Commission, Research and Development Report*, ISC-407, Jan. 1954, 107 p. (UF767 Un3.1is Contin.)

Investigation to study the sulfuric acid digestion of monazite sand, and to prepare a Th-containing material from the resulting solution which would be suitable for further purification by liquid-liquid extraction.

15348 Caustic Leaching of Manganese Flotation Concentrate From Artillery Peak, Ariz. E. C. Perkins. *U. S. Bureau of Mines, Report of Investigations* 5341, June 1957, 16 p. (TN21 Un3R)

Caustic leaching was successful in lowering the silica plus alumina content from 19.9 to 14.3%. Pilot-plant and laboratory investigations were made for the ranges of variables: 15 min. to 16 hr., 28.5 to 70% solids, 70 to 1,000 lb. of caustic per ton of concentrate, and 10 to 40% caustic in solution.

15349 Leach-Precipitation-Flotation Tests of a California Copper-Gold Ore. A. L. Engel and H. J. Heinen. *U. S. Bureau of Mines, Report of Investigations* 5342, June 1957, 9 p. (TN21 Un3r)

Extraction from ore ground to -10 mesh was 92% in 24 hr., whereas ore ground to either -100 mesh or -200 mesh yielded 94% of the Cu in 2 hr. Amalgamation tests under varying conditions, on either the original ore or Cu-leach tailing, recovered no more than about 20% of the Au content.

See also: **14947** (ball and rod mill liners).

PHYSICS

15350 Sound and Ultrasound Absorption Resulting From Heat Radiation. A. B. Bhatia. *Acoustical Society of America, Journal,* v. 29, July 1957, p. 823-824.

The Stefan-Boltymann radiation law is applied to estimate the attenuation of approximately plane compression waves resulting from heat radiation.

15351 Some Secondary Effects Related to Impact Wave Forms. J. S. Nisbet and J. N. Brennan. *Acoustical Society of America, Journal,* v. 29, July 1957, p. 837-842.

Considers changes in the shock spectrum that may arise from minor variations in the form of an applied pulse. The nature and symmetry of the discontinuities has a profound effect on the H.F. components.

15352 Mollier Diagrams for Water Near Bubble Point. André Van Haute and B. H. Sage. *ASME, Transactions,* v. 79, July 1957, p. 1192-1196.

15353 On the Specific Heat of Solids at Low Temperatures. T. H. K. Barron and J. A. Morrison. *Canadian Journal of Physics,* v. 35, July 1957, p. 799-810.

Includes data on KCl, LiF, white Sn, W, the noble metals, and elements of diamond structure.

15354* (English.) **Photo-Dichroism of Printed-Out Silver. II. Theoretical Consideration of the Mechanism From the Point of View That the Phenomenon of Photo-Dichroism Would be an Anisotropic Herschel Effect. III. Absorption Spectra and Dichroism.** Isao Kamiya. *Chemical Society of Japan, Bulletin,* v. 30, Apr. 1957, p. 294-302.

15355* On the Eigenfunctions of Many-Particle Systems in Quantum Mechanics. Tosio Kato. *Communications on Pure and Applied Mathematics,* v. 10, May 1957, p. 151-177.

All eigenfunctions of such a system are continuous throughout the configuration space, and have partial derivatives of first order which are bounded.

15356* (French.) Variation of the Resonance Field in Nickel-Zinc Ferrite-Chromites. **Variation du champ de résonance dans des ferrites-chromites de nickel-zinc.** Roger Vautier and Wladimir Kagan. *Comptes Rendus,* v. 244, June 17, 1957, p. 3040-3043.

The field producing resonance was reduced by decrease of magnetization obtained by partial substitution of Cr_2O_3 for Fe_2O_3. Variations differ from those predicted by the classical theory of ferromagnetic resonance.

15357* (Russian.) On the Appearance of Wavy Glide Lines in Silver Chloride Crystals. **O vozniknovenii volnistykh linii skol'zheniia v kristallakh khloristogo serebra.** M. P. Shaskol'skaia and V. E. Kochnov. *Doklady Akademii Nauk SSSR,* v. 113, Apr. 11, 1957, p. 1061-1062 + 1 plate.

Investigation of wavy glide lines appearing during stretching of polycrystalline thin AgCl crystals.

15358 Elasticity, Fracture and Flow With Engineering and Geological Applications. J. C. Jaeger. 152 p. 1956. John Wiley & Sons, New York. (QA931 J17e)

The basic mathematics of the theories of elasticity, plasticity, viscosity, and rheology, together with a discussion of the properties of the materials involved and the way in which they are idealized to form a basis for the mathematical theory.

15359 Review of Articles on Luminescence for 1955-1956. Gorton R. Fonda. *Electrochemical Society, Journal,* v. 104, Aug. 1957, p. 524-530.

Covers oxygen-dominated phosphors, sulfide phosphors, cathodoluminescence, and electroluminescence.

15360 Wetting and the Mixing of Surface Phases. R. F. Deacon. *Faraday Society, Transactions,* v. 53, July 1957, p. 1014-1019.

An analogy between the phenomena of miscibility and wetting is pointed out, and developed to predict critical wetting temperatures and a relation between the contact angle and the respective latent heats of evaporation between two phases.

15361 Note on the Relativistic Harmonic Oscillator. Louis Gold. *Franklin Institute, Journal,* v. 264, July 1957, p. 25-28.

The relativistic harmonic oscillator is solved by an inverse fractional power series as has been done for the simple pendulum.

15362* The Measurement of Complex Permittivity and Complex Tensor Permeability of Ferrite Materials at Microwave Frequencies. I. G. MacBean. *Institution of Electrical Engineers, Proceedings,* v. 104, pt. B, Suppl. 6, 1957, p. 296-306.

Range and accuracy of the apparatus; results of measurements on a wide range of ferrites using a cavity technique.

15363* Microwave Faraday Effect and Conductivity in Nickel Ferrites and Ferrite-Aluminates. R. Derry and M. S. Wills. *Institution of Electrical Engineers, Proceedings,* v. 104, pt. B, Suppl. 6, 1957, p. 324-330.

Nickel ferrite was prepared from pure ferric and Ni oxides by firing at temperatures between 1090 and 1350 C. Influence of firing temperature on the Faraday effect at 3 cm. wavelength was studied.

15364* (Russian.) On the Theory of Hysteresis Phenomenon in $BaTiO_3$. **K teorii gisterezisnykh iavlenii v $BaTiO_3$.** L. P. Kholodenko. *Izvestiia Akademii Nauk SSSR, Seriia Fizicheskaia,* v. 21, Mar. 1957, p. 368-373.

Mathematical analysis of hysteresis in an ideal crystal.

15365* (Russian.) Pyroeffect and Piezoeffect in Polycrystalline Barium Titanate. **Piroeffekt i p'ezoeffekt v polikristallicheskom titanate bariia.** M. S. Kosman and Z. A. Shampo. *Izvestiia Akademii Nauk SSSR, Seriia Fizicheskaia,* v. 21, Mar. 1957, p. 399-401.

Effect of temperature on piezoelectric properties.

15366* (Russian.) Kinetics of Infrared Luminescence of Cuprous Oxide. **Kinetika infrakrasnogo svecheniia zakisi medi.** N. A. Tolstoi, N. N. Tkachuk, and R. K. Preobrazhenskii. *Izvestiia Akademii Nauk SSSR, Seriia Fizicheskaia,* v. 21, Apr. 1957, p. 521-522.

The "ultratautometer" method (with an electro-optical light modulator) made it possible for the first time to study the luminescence kinetics of cuprous oxide.

15367* (Russian.) Luminescence of Silver Halides. **Luminestsentsiia galoidnykh solei serebra.** S. I. Golub. *Izvestiia Akademii Nauk SSSR, Seriia Fizicheskaia,* v. 21, Apr. 1957, p. 534-535.

The quenching of luminescence in AgCl and AgBr + AgI (about 1 mole %) crystals follows the hyperbolic law with

fractional index: $1 = At^{-a}$ where $a = 0.25$. Thus, it is a recombination process, and the silver halides can be considered as crystal phosphors activated by heavy metals.

15368* (Russian.) Methods and Instruments for Measuring Luminescence. **Metody i pribory dlia izmereniia liuminestsentsii.** D. A. Shklover and R. S. Ioffe. *Izvestiia Akademii Nauk SSSR, Seriia Fizicheskaia*, v. 21, Apr. 1957, p. 619-622.

A special television colorimeter was designed for measuring the optical features of luminescence such as brightness, light-emission, spectral composition of radiation, and color.

15369 Frequency Spectrum of the Barkhausen Noise. G. Biorci and D. Pescetti. *Journal of Applied Physics*, v. 28, July 1957, p. 777-780.

The spectral density of the Barkhausen noise was measured and a theoretical interpretation of the results is given. The model introduced to explain the mechanism giving rise to the noise leads to the conclusion that the intensity of the spectrum is proportional to the frequency of the magnetizing current.

15370 Acoustic Relaxations in Ferrite Single Crystals. D. F. Gibbons. *Journal of Applied Physics*, v. 28, July 1957, p. 810-814.

Acoustical wave attenuation measurements show the existence of two types of stress-induced relaxations and a transformation in the ferrites examined.

15371 Reflection of Plant Waves of Sound From a Sinusoidal Surface. H. S. Heaps. *Journal of Applied Physics*, v. 28, July 1957, p. 815-818.

15372 Imperfections in Crystals. II. Color Centers, Dislocations, Phonons, and Excitons. J. M. Honig. *Journal of Chemical Education*, v. 34, July 1957, p. 343-350.

15373 Compressibility of Gases. II. Mixtures of Carbon Dioxide and Helium at 30° C. Robert C. Harper, Jr. and John G. Miller. *Journal of Chemical Physics*, v. 27, July 1957, p. 36-39.

15374* Reflection and Refraction of Electromagnetic Waves at Plane Interfaces. W. E. Williams. *Journal of Mathematics and Physics*, v. 36, Apr. 1957, p. 26-35.

Mathematical analysis.

15375* (French.) Magnetization Energy. **L'energie d'aimantation.** Roger Vautier. *Journal des Recherches du Centre National de la Recherche Scientifique*, no. 38, Mar. 1957, p. 23-29.

Origin and nature of the magnetic energy in the air-gap of the magnetic circuit of a permanent magnet.

15376 Control of Noise by Sound-Absorbent Materials. T. Mariner. *Noise Control*, v. 3, July 1957, p. 11 + 9 pages.

Types and uses of various sound-absorbent materials.

15377 Fiber Optics. III. Field Flatteners. N. S. Kapany and R. E. Hopkins. *Optical Society of America, Journal*, v. 47, July 1957, p. 594-598.

Working models of field flatteners using 200μ diameter glass fibers were constructed which demonstrate the expected gain in image quality.

15378 Separation of Overlapping Orders of a Concave Grating Spectrograph in the Vacuum Ultraviolet Region. A. E. Douglas and G. Herzberg. *Optical Society of America, Journal*, v. 47, July 1957, p. 625-628.

Shows that by a suitable choice of constants of the foregranting it is possible to eliminate the astigmatism of the whole system.

15379 Linearizing Infrared Spectra. Frederick S. Brackett. *Optical Society of America, Journal*, v. 47, July 1957, p. 636-638.

Accomplished by substituting commercially available cans for the existing tangent screw drive in Perkin-Elmer models 13, 12, and 112.

15380 Critical Comment on a Method for Determining Electron Trap Depths. C. H. Haake. *Optical Society of America, Journal*, v. 47, July 1957, p. 649-652.

Analyzes Garlick and Gibson's methods.

15381 (English.) **The Approach to Equilibrium in Quantum Statistics.** Leon Van Hove. *Physica*, v. 23, June 1957, p. 441-480.

Derivation and analysis of a generalized master equation valid to arbitrary order in the perturbation.

15382 (English.) **Perturbation Theory of Large Quantum Systems.** N. M. Hugenholtz. *Physica*, v. 23, June 1957, p. 481-532.

The time-independent perturbation theory is studied for systems with large spatial dimensions and a large number of degrees of freedom. Only systems at or near the ground state are treated.

15383 Diffraction of Thermal Waves in Liquid Helium II. J. E. Mercereau and J. R. Pellam. *Physical Review*, v. 106, ser. 2, June 15, 1957, p. 1113-1116.

Diffraction effects were produced by means of a thermal grating radiating a primary (zero-order) beam accompanied by higher order beams at appropriate Bragg angles.

15384 Eigenvalues and Eigenfunctions of a Bose System of Hard Spheres and Its Low-Temperature Properties. T. D. Lee, Kerson Huang, and C. N. Yang. *Physical Review*, v. 106, ser. 2, June 15, 1957, p. 1135-1145.

The pseudopotential method can be used for an explicit calculation of the first few terms in an expansion in power of $(pa^3)^{1/2}$ of the eigenvalues and the corresponding eigenfunctions of a system of Bose particles with hard-sphere interaction, where p is the particle sphere and a the hard-sphere diameter.

15385 Elastic Constants of LiF From 4.2°K to 300°K by Ultrasonic Methods. C V. Briscoe and C. F. Squire. *Physical Review*, v. 106, ser. 2, June 15, 1957, p. 1175-1177.

15386 Microwave Absorption in Ethyl Chloride. Krishnaji and G. P. Srivastava. *Physical Review*, v. 106, ser. 2, June 15, 1957, p. 1186-1190.

The variation of the microwave absorption coefficient with pressure in ethyl chloride was determined at 7.392 mc./sec. and 8780 mc./sec.

15387* (English.) **Geometrical Theory of Convex Molecules in Non-Uniform Gases.** Taro Kihara. *Physical Society of Japan, Journal*, v. 12, June 1957, p. 564-569.

Theory for uniform gases is generalized for non-uniform gases when molecules are represented by rigid convex bodies with no additional intermolecular force. Shape and size of several molecules are determined from diffusion coefficients.

15388* (English.) **Statistical-Mechanical Theory of Irreversible Processes. I. General Theory and Simple Applications to Magnetic and Conduction Problems.** Ryogo Kubo. *Physical Society of Japan, Journal*, v. 12, June 1957, p. 570-586.

A general type of fluctuation-dissipation theorem is discussed to show that the physical quantities such as complex susceptibility of magnetic or electric polarization and complex conductivity for electric conduction are rigorously expressed in terms of time-fluctuation of dynamic variables associated with such irreversible processes.

15389* (English.) **Diffuse Scattering of X-Ray by a Point-Imperfection in Diamond Lattice.** Sigeo Yomosa and Takeo Nagamiya. *Physical Society of Japan, Journal*, v. 12, June 1957, p. 610-617.

The intensity of diffuse scattering is calculated in terms of the force constants which are related to changes in bond length and bond angle.

14390* (English.) **Structural Investigation of Means of Nuclear Quadrupole Resonance. I. Determination of Crystal Symmetry. II. Tin Tetrabromide.** Kenji Shimomura. *Physical Society of Japan, Journal*, v. 12, June 1957, p. 652-667.

The number of nonequivalent directions of the z-axes of the field gradient in the crystal for every symmetry class was calculated. Crystal structure of $SnBr_4$ was studied at room temperature using the universal quadrupole resonance crystal analyzer.

15391* (English.) **Electronic Structure of Simple Homonuclear Diatomic Molecules. I. Oxygen Molecule.** Masao Kotani, Yukio Mizuno, Kunihusa Kayama, and Eiichi Ishiguro. *Physical Society of Japan, Journal*, v. 12, June 1957, p. 707-736.

15392* On Collective and Internal Motions in a Bose System. Toshiyuki Nishiyama. *Progress of Theoretical Physics*, v. 17, May 1957, p. 711-732.

The energy for the ground state and the excitation energies of collective motion and internal motion are obtained for the case of a long-range interaction potential.

15393* (English.) **A Theory of the Uniaxial Anisotropy Induced by Magnetic Annealing in Ferrites.** Satoshi Taniguchi. *Science Reports of the Research Institutes, Tôhoku University*, ser. A, v. 9, June 1957, p. 196-214.

The uniaxial anisotropy induced by magnetic annealing in ferrite is caused by an anisotropic distribution among cations and cation vacancies, namely, by a mechanism similar to that in ferromagnetic metallic solid solutions.

15394* (Russian.) Measurement of High Temperatures in Strong Shock Waves in Gases. **Izmerenie vysokikh temperatur v sil'nykh udarnykh volnakh v gazakh.** I. Sh. Model'. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, v. 32, Apr. 1957, p. 714-726 + 1 plate.

A photographic method for measurement of high temperatures and the absorption coefficient of radiation of gases in plane shock waves.

15395* (Russian.) On the Theory of Seignettoelectric Properties of Polarized Barium Titanate Ceramic. **K teorii segnetoelektricheskikh svoistv poliarizovannoi keramiki titanata bariia.** L. P. Kholodenko and M. Ia. Shirobokov. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, May 1957, p. 929-935.

Tensor calculations of dielectric constant and piezo-modulus of a polarized barium titanate ceramic for all seignetto-electric phases by the method of neutralization of appropriate values for monocrystals.

See also: **14124** (properties of Mn-Ni ferrites); **14138** (piezoelectric properties of $BaTiO_3$); **14145** (magnetic properties of ferrites); **14485** (solutions of He^3 and He^4); **14581** (short duration magnetic fields); **14754** (acoustic waves); **14786** (detonation and shock-wave); **15545** (statistics of random disorientation of cubic crystals).

PLASTICS

15396 Synthesis of Poly-β-Alanine From Acrylamide. A Novel Synthesis of β-Alanine. David S. Breslow, George E. Hulse, and Albert S. Matlack. *American Chemical Society, Journal*, v. 79, July 20, 1957, p. 3760-3763.

Preparation by the base-catalyzed polymerization of acrylamide.

15397 Inelastic Deformation of Nylon Under Compression. C. C. Hsiao. Paper from "American Society for Testing Materials, Proceedings". v. LVI. 1956. p. 1425-1436. (TA401 Am35p Vis.)

At constant strains, the effect of log of strain rate on loading is found to be linearly related within the range of rate of straining investigated. If this linear relationship is extended, stress-strain properties at fairly low rates of straining can be extrapolated and long-time creep or relaxation characteristics of the material at high stress levels and large deformations may be derived.

15398 The Ultrasonic Degradation of Polystyrene at a Frequency of 1 Mc/s. N. H. Langton and P. Vaughan. *British Journal of Applied Physics*, v. 8, July 1957, p. 289-292.

15399* (Russian.) Polymerization of 2-Vinylpyridine and 2-Vinylquinoline. **Polimerizatsiia 2-vinilpiridina i 2-vinilkhinolina.** M. M. Koton and O. K. Surnina. *Doklady Akademii Nauk SSSR*, v. 113, Apr. 11, 1957, p. 1063-1065.

Snythesis of 2-vinylpryidine and 2-vinylquinoline by reaction of picoline and quinaldine with paraform aldehyde and ensuing dehydration of obtained carbinols over caustic potash. Polymerization kinetics.

15400* (Russian.) Properties of Graphite Filled Plastics and the Effect of High Filling. **Svoistva napolnennykh grafitom plastmass i effek vysokogo napolneniia.** B. L. Tsetlin, L. P. Ianova, G. K. Sibirskaia, and P. A. Rebinder. *Doklady Akademii Nauk SSSR*, v. 114, May 1, 1957, p. 146-149.

Effects of composition on the properties of bakelite and PVC graphites mechanical resistance at 20 and 120 C, thermal conductivity, and thermostability.

15401 Tensile Strength of Plastics Below the Glass Temperature. F. Bueche. *Journal of Applied Physics*, v. 28, July 1957, p. 784-787.

The times taken for two plastics, polystyrene and polyethyl methacrylate, to break under various constant loads are reported for both the glassy and rubbery states. The logarithm of the time taken for the sample to break is proportional to the applied load.

15402 Nuclear Magnetic Relaxation in Polytetrafluoroethylene and Polyethylene. C. W. Wilson and G. E. Pake. *Journal of Chemical Physics*, v. 27, July 1957, p. 115-122.

15403 Photochemical Processes in Solids. The Kinetics of Free Radical Reactions in Nylon. Roger A. Ford. *Journal of Colloid Science*, v. 12, June 1957, p. 271-282.

15404 Dynamic Mechanical Properties of Poly-*n*-Butyl Methacrylate. William C. Child, Jr. and John D. Ferry. *Journal of Colloid Science*, v. 12, June 1957, p. 327-341.

15405* Infrared Spectrum and Crystal Structure of Cellulose. Masamichi Tsuboi. *Journal of Polymer Science*, v. 25, July 1957, p. 159-171.

Spectra of oriented cellulose fibers were observed using polarized radiation.

15406* Mechanism of the Radiation Crosslinking of Polyethylene. R. W. Pearson. *Journal of Polymer Science*, v. 25, July 1957, p. 189-200.

Observed chemical changes are accounted for by means of a consistent chemical mechanism, whose kinetics are calculated.

15407* *p*-Vinylbenzyltrialkyl Ammonium Salts in Vinyl Polymerization. Giffin D. Jones and Shirley J. Goetz. *Journal of Polymer Science*, v. 25, July 1957, p. 201-215.

Polymers and copolymers of the quaternary monomer vinylbenzyltrimethylammonium chloride were studied.

15408* Automatic Recording, Gas/Polymer-Film Permeameter. Bernard Rosen and J. H. Singleton. *Journal of Polymer Science*, v. 25, July 1957, p. 225-228.

15409* (German.) The Effect of Plasticizers on PVC Conveyor Belts. **Einfluss des Weichmacheranteils bei PVC-Fördergurten.** Bernd Passmann. *Kautschuk und Gummi*, v. 10, June 1957, p. 135-136.

Inflammability, flexibility, resistance to abrasion, maximum load, and electrical resistance of belts with varying plasticizer contents, with and without antistatic agents.

15410* (German.) Vestolit S. A PVC Suspension Polymer. **Vestolit S. Ein Suspensions-Polyvinylchlorid.** Georg Wick and Helmut König. *Kunststoffe*, v. 47, June 1957, p. 299-302.

Polymers with K values between 50 and 65 are suitable for processing without plasticizers. This has opened up new possibilities for the manufacture of rigid pipes, foil, and sheet.

15411* (German.) Preforming of Glass Fiber Reinforced Plastics. **Vorformen von glasfaserverstärkten Kunststoffen.** Harro Hagen. *Kunststoffe*, v. 47, June 1957, p. 329-332.

Developments in preforming methods are summarized, with special reference to the manufacture of the best type of preforming screens, optimum binder combinations, and the prevention of static charges which in turn prevents contamination of the machine.

15412 These Curves Give Fatigue Properties of Reinforced Plastics. *Materials in Design Engineering*, v. 46, July 1957, p. 108-111.

Data on glass-reinforced laminates subjected to repeated stresses.

15413 The Coloration of Plastics by Irradiation. II. S. H. Pinner and A. J. Swallow. *Plastics*, v. 22, July 1957, p. 268-270.

The color changes with plastics containing PVC are dependent on the other components of the material. Applications of permanent color changes are discussed.

15414* Glass Reinforcement for Structural Plastics. R. G. Adams and Ralph Sonneborn. *Plastics Industry*, v. 15, July 1957, p. 26 + 4 pages.

A review of the production methods and uses of fiberglas reinforcement for plastics.

15415 Epoxy Casting Resins Simplify Three-Dimensional Photoelasticity. M. M. Leven. *Product Engineering*, v. 28, July 1957, p. 135-140.

An up-to-date evaluation of the best model materials, simplest equipment, and most effective methods for practical three-dimensional photoelastic stress analysis of complex structures and parts.

15416* (French.) Surface Treatment of Polyethylene for Printing. **Traitement en surface du polyéthylène en vue de son impression.** F. Chevassus. *Revue Générale du Caoutchouc*, v. 34, May 1957, p. 478-483.

Five processes for modifying the surface of this polymer for allowing printing.

15417* (Italian.) Styrene Polymerization in the Presence of Gamma Rays, and the Resulting Changes in Some Physical Constants of the Polymers Obtained. **Polimerizzazione dello stirene in presenza di raggi gamma e conseguenti modificazioni di alcune constanti fisiche dei polimeri ottenuti.** Angelo Drigo and Licia De Marco. *Ricerca Scientifica*, v. 27, Mar. 1957, p. 721-729.

Comparisons between average mol. wt. of irradiated polymers and the ones not irradiated.

15418* (German.) The Adherence of Inserted Glass Silk Fabrics to Polyester Resins. **Über die Haftfestigkeit eingebetteter Glasseidengewebe an Polyesterharzen.** Wilhelm Hinz and Gerhard Solow. *Silikattechnik*, v. 8, May 1957, p. 178-185.

Adherence was determined as a function of the chemical composition and surface treatment of the fabrics. An improved adherence is caused by unsaturated chlorine-silane compositions acting as intermediate binding materials.

15419* Shape Extrusion Studies on Nylon Resin. Karel G. Toll. *SPE Journal*, v. 13, July 1957, p. 17-21.

Operation and design of extruders for Zytel 42; die design and take-off techniques.

15420* Styrene Monomers. Safety in Handling and Storage. Robert F. Helmreich. *SPE Journal*, v. 13, July 1957, p. 22-24.

The fire hazard involved in handling styrene is the same as that for any flammable organic liquid. The reaction of styrene monomer with dissolved O from the air requires special attention to avoid contact with air, and consequent degradation.

15421* Relations Between the Hydraulic System and Polymer Flow in Molding. O. M. Hahn. *SPE Journal*, v. 13, July 1957, p. 25-29.

Polymer characteristics, heating cylinder, mold design, and hydraulic system are each a factor in determining polymer flow rate. The interdependence of these factors is discussed with particular emphasis on the characteristics of the hydraulic system.

15422* Methylstyrene Molding Compounds. J. A. Melchore. *SPE Journal*, v. 13, July 1957, p. 33-37.

Polymethylstyrene and methylstyrene-acrylonitrile copolymer have remarkable heat resistance characteristics and several other unique properties suggesting many areas of diversified applications.

15423* Cellular Vinyl Foams. W. G. McLain. *SPE Journal*, v. 13, July 1957, p. 41-44.

Production methods, properties, and applications.

15424 Supplement to Directional Properties of Glass-Fabric-Base Plastic Laminate Panels of Sizes That Do Not Buckle. Fred Werren and Marvin Gish. *U. S. Department of Agriculture, Forest Products Laboratory, Report No.* 1803-C, May 1957, 24 p. (TS800 Un3.3r Contin.)

Gives directional curves for several epoxy laminates. Reduced values of moduli and ultimate strength properties were used in computing data for the curves.

15425* (German.) Polyvinylchloride Plastic Pipes. **Polyvinylchlorid-Plastikrohre.** W. Köhler. *Werkstoffe und Korrosion*, v. 8, June 1957, p. 324-329.

Commercial types and their dimensions; physical characteristics and corrosion behavior; methods of installation and fitting.

15426* (Russian.) A Study of the Macrostructure of Cellulose Ester Films. **Issledovanie makrostruktury efirotselliuloznykh plenok.** P. V. Kozlov and B. N. Korostylev. *Zhurnal Fizicheskoi Khimii*, v. 31, Mar. 1957, p. 653-658.

Using cellulose triacetate films as examples, the existence of a heterogeneous microstructure is proven, the internal structures of the film surface differing from those of the lower layers. The upper layers possess the densest chain packing.

See also: **14286** (analysis of methacrylic acid); **14361** (heterochain polyesters); **15483** (cellulose triacetate); **15487** (vinylidene cyanide).

POLLUTION AND WASTES

15427 Latest Methods You Can Use for Industrial Odor Control. John Von Bergen. *Chemical Engineering*, v. 64, Aug. 1957, p. 239-250.

15428* The Air Pollution Survey. W. L. Faith. *Industrial Wastes*, v. 2, July-Aug. 1957, p. 83-87.

Discussion of why, when and how air pollution surveys should be made.

15429* A Rational Program for Stream Pollution Control. Richard D. Hoak. *Industrial Wastes*, v. 2, July-Aug. 1957, p. 88-91.

Fundamental but controversial aspects of rational planning for stream pollution control.

15430* Lime Treatment of Lake Reduces Acid Mine Waste Pollution. Vernon W. Cole. *Industrial Wastes*, v. 2, July-Aug. 1957, p. 100-103.

Deals with a lake that had been damaged by acid mine wastes and its return to normal for several yrs. as a result of treatment with lime.

15431* Field Tests for Toxic Substances in Industrial Atmospheres. B. E. Dixon. *Instrument Practice*, v. 2, June 1957, p. 598-601.

Simple tests and necessary apparatus.

15432* Some Analytic and Clinical Methods in the Study of Atmospheric Pollution. P. J. Lawther. *Instrument Practice*, v. 2, June 1957, p. 611-615.

"Man" is used as an instrument in determining dangerous atmospheric pollution.

15433 Utilizing and Disposing of Waterborne Industrial Wastes. A. A. Berk. *Mining Engineering*, v. 9; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 208, July 1957, p. 780-783.

Facts finding and applied research are needed to control waterborne mineral wastes and to use them economically.

15434* Atmospheric Pollution. A. C. Monkhouse. *Science Progress*, v. 45, July 1957, p. 418-428.

Control methods in the next decade should result in a considerable reduction in smoke pollution, both from industrial and domestic chimneys.

15435* A Review of the Literature of 1956 on Sewage, Waste Treatment, and Water Pollution. II. *Sewage and Industrial Wastes*, v. 29, July 1957, p. 727-756.

Deals with water pollution.

15436* Aeration Requirements of a High Oxygen Demand Sewage. Robert D. Bargman, Jack M. Betz, and William F. Garber. *Sewage and Industrial Wastes*, v. 29, July 1957, p. 768-790.

The high-rate aeration method is inherently unstable and necessitates close and accurate process control, but an effluent of good quality susceptible to chlorination can be developed.

15437* Underground Movement of Radioactive Wastes. R. G. Orcutt, M. N. E. Rifai, G. Klein, and W. J. Kaufman. *Sewage and Industrial Wastes*, v. 29, July 1957, p. 791-804.

The feasibility of employing underground formations for the retention or permanent storage of radioactive wastes is dependent on the chemical and physical compatibility of the waste with the receiving formation, and the degree of certainty of predicting the velocity and direction taken by the more hazardous components of the waste.

15438* Water Conservation and Reclamation System for a Copper Wire Mill. G. W. Pirk. *Sewage and Industrial Wastes*, v. 29, July 1957, p. 805-809.

A NaOH treatment is simple, inexpensive, and does not result in harmful contamination of the recovered copper oxide.

15439* The B. O. D. Test in Textile Mill Waste Problems. H. Heukelekian. *Textile Industries*, v. 121, July 1957, p. 74 + 7 pages.

Dependence of B.O.D. on the presence and activity of microorganisms; influence of environmental conditions; influence of organic matter and dissolved oxygen concentrations; use of synthetic dilution water; methods for determination of dissolved O.

15440 A Fallout Forecasting Technique With Results Obtained at the Eniwetok Proving Ground. E. A. Schuert. *U. S. Naval Radiological Defense Laboratory, Research and Development Technical Report*, USNRDL-TR-139, Apr. 1957, 60 p. (QC475 Un3.5r Contin.)

Technique whose complexity is dependent on the required accuracy of the results desired was satisfactorily tested for land surface and water surface bursts.

15441* *Water & Sewage Works (Reference and Data Number)*, v. 104, June 30, 1957, 400 p.

A handbook covering management, maintenance operation, and engineering fundamentals in the field of water and sewage works practices.

See also: **14640** (disposal of electroplating wastes); **15471** (industrial ventilation).

RUBBER AND ELASTOMERS

15442* New Silicone Rubber Combines Tensile Strength and Heat Resistance. J. C. Caprino and Richard M. Savage. *Aviation Age*, v. 28, July 1957, p. 58-63.

New rubbers have very high tensile strength when cured for short periods at high temperature, and still have the strength of typical silicone rubber at 480 F.

15443* Measurement of Some Tyre Properties. H. C. J. de Decker, G. J. van Amerongen, and J. F. Benders. *Institution of the Rubber Industry, Transactions*, v. 33; *Proceedings*, v. 4, June 1957, p. 115-131.

Properties which influence the cost of driving and which can be varied within certain limits without serious damage to comfort and safety, are tread wear and fuel consumption The cost per mile with natural rubber and cold GR-S treads are discussed.

15444 Mechanical Properties of a Polyurethane Elastomer in the Rubber-to-Glass Transition Zone. Robert F. Landel. *Journal of Colloid Science*, v. 12, June 1957, p. 308-320.

15445* Mastication of Rubber. VI. Viscosity and Molecular Weight Relationships for Natural Rubber After Cold Mastication. D. J. Angier, W. T. Chambers, and W. F. Watson. *Journal of Polymer Science*, v. 25, July 1957, p. 129-138.

A calibration of limiting viscosity against mol. wt. was obtained for masticated rubber.

15446* Filler Reinforcement of Silicone Rubber. A. M. Bueche. *Journal of Polymer Science*, v. 25, July 1957, p. 139-149.

Results in variance with other work, indicate that the increase in modulus and decrease in swelling are due primarily to polymer-filler attachments.

15447* Crosslinking of Oriented Rubber. A. Charlesby and E. von Arnim. *Journal of Polymer Science*, v. 25, July 1957, p. 151-158.

Smoked sheet rubber was crosslinked in the absence of vulcanizing agents with 2 m.e.v. electrons.

15448* A Spectroscopic Study of Oils Used in Oil-Extended Rubber. Frederic J. Linnig and James E. Stewart. *Journal of Research, National Bureau of Standards*, v. 59, July 1957, p. 27-40.

15449* (German.) Recent Developments in the Physics of Rubber. **Neuere Ergebnisse der Kautschuk-Physik.** A. Schallamach. *Kautschuk und Gummi*, v. 10, June 1957, p. WT135-WT140.

Elasticity, resistance to tearing and to abrasion of various filled and unfilled natural rubber vulcanizates.

15450* (German.) Growth of Ruptures in Filled High Polymers. **Zum Risswachstum bei gefüllten Hochpolymeren.** Ernst August Hampe. *Kautschuk und Gummi*, v. 10, June 1957, p. WT141-WT145.

Rupture progression rates for test specimens differing in form and treatment. Relationship of depth and length, temperature, and modulus of elasticity.

15451* (German.) Thermochemistry of Rubber Vulcanization. **Zur Thermochemie der Kautschukvulkanisation.** Lothar Hock and Gerhard Schröter. *Kolloid-Zeitschrift*, v. 152, June 1957, p. 98-115.

Calorimetric measurement of vulcanization heats. Role of heat and S.

15452 The Fluoro-Elastomers: Latest Weapon Against Heat and Fluids. Malcolm W. Riley. *Materials in Design Engineering*, v. 46, July 1957, p. 90-98.

Compares and summarizes data just released on the five fluorinated elastomers, the newest family of rubbers developed to withstand corrosive fluids and extremes of temperatures.

15453 How to Predict Performance of Rubber Vibration Isolators. Walter W. Soroka. *Product Engineering*, v. 28, July 1957, p. 141-145.

New method of analysis accounts for creep of visco-elastic materials such as rubber, nylon, rayon, and fibrous materials; can lead to designs with lower transmissibility and better performance under shock.

15454* (German.) Fundamental Physical Phenomena in Stressed Materials. **Physikalishche Grunderscheinungen in belasteten Korpern. IV.** W. Späth. *Radex Rundschau*, no. 3, May 1957, p. 555-563.

Variation of conductivity in a rubber specimen is tested under mechanical load. Effects of static loads are construed as a result of destruction and re-combination of interstratified C aggregates.

15455* (French.) Tuboryl, a Special Filler for Butyl Rubber. **Une charge spéciale pour le butyl-caoutchouc: le tuboryl.** Jean Dumonthier. *Revue Générale du Caoutchouc*, v. 34, May 1957, p. 469-471.

This anhydrous aluminum silicate is a fine powder with 2μ particle size. Two physical properties are worthy of special attention: absence of water-porousness and a color which allows preparation of compounds of a wide range of shades.

15456* (French.) Rubber-Red Clay Masterbatches. **Mélanges-maîtres de caoutchouc et d'argiles. I.** Description and Preparation. **Description et preparation.** G. Giger and M. Liponski. *Revue Cénérale du Caoutchouc,* v. 34, May 1957, p. 473-477.

Preparation of masterbatches by coflocculating a water suspension of local red-tinted clay and latex; untreated mineral filler can thus compete with carbon blacks.

15457* (English.) **Block and Graft Copolymers From Natural Rubber.** P. W. Allen and D. Phil. *Revue Générale du Caoutchouc,* v. 34, May 1957, p. 495-497.

Describes recent work carried out with the intention of obtaining desirable materials by the chemical combination of vinyl polymers with natural rubber. Work is confined mainly to the two monomers styrene and methyl methacrylate.

15458* (English.) **From Modified Rubbers to Graft Polymers.** J. Le Bras. *Revue Générale du Caoutchouc,* v. 34, June 1957, p. 607-613.

A summary of research on the possible reactions between rubber and ethylenic compounds in solution, emulsion, and in the mass.

15459* (English and French.) **The pH-Meter in Rubber Industrial Coagulation as a Source of Savings and Improvements of Quality.** J. D'Auzac. *Revue Générale du Caoutchouc,* v. 34, June 1957, p. 613-616.

15460* (English and French.) **Rapid Acid Coagulation Method for Fresh Natural Latex.** *Revue Générale du Caoutchouc,* v. 34, June 1957, p. 617-619.

The CEXO method boasts advantages in rapidity, semicontinuous processing, and regularity of the product; also savings on equipment washing water, maintenance, cleaning and sorting manpower, and on calories by reduction of drying times

15461 Friction of Rubber on Rough Surfaces. F. W. Boggs and W. P. Riemen. *Rubber Age,* v. 81, July 1957, p. 613-618.

A proposed mechanism by which rubber is lost, permitting a prediction of the merit of tread materials on laboratory data.

15462 Antioxidants and Antiozonants. *Rubber Age,* v. 81, July 1957, p. 623-631.

Five papers on: industrial growth and theory of function; uses in tires and tubes, latex, molded and extruded goods, and in wire and cable.

15463* A Versatile New Family of Elastomers. I. G. E. Meyer, et al. *Rubber World,* v. 136, July 1957, p. 529-536.

Elastomers were prepared by free radical addition of aliphatic mercaptans to the double bonds of diene polymers. High saturation levels were readily achieved without degradation of the basic polymer chain. Resistance to aging, ozone attack, heat, solvent swelling, permeation by gases, and γ radiation increased with increasing saturation. (To be continued.)

15464* Urethane Elastomers. W. G. Ogden. *Rubber World,* v. 136, July 1957, p. 537-542.

New type that can be cured with sulfur and conventional accelerators has improved processing characteristics, storage and thermal stability, and other advantages as a result of the change from the conventional diisocyanate curing systems.

See also: **14236** (analysis of rubber vulcanizates).

SPACE HEATING AND CONDITIONING

15465 Cooling Robot Brains. Nelson E. Sheldon, Clarence A. Nolph, and Gordon A. Fleischer. *Electronic Industries & Tele-Tech,* v. 16, July 1957, p. 46 + 1 page.

Methods of air conditioning electronic computers for longer tube life.

15466* New Heat Pumps for Heating Purposes. H. Kubli. *Escher Wyss News,* v. 29, Sept.-Dec. 1956, p. 10-15.

It is possible to make a simple and quick estimate of the economy of a heat pump for a given heating plant using the two diagrams given. Two recently built heat pump plants are described.

15467 Fuel Economy and the Heat Pump. M. V. Griffith. *Fuel Efficiency,* v. 5, June 1957, p. 267 + 4 pages.

An appraisal of performance and costs of an effective heating appliance.

15468* Steam Turbines for Air Conditioning. Orbie Bostick. *Gas Age,* v. 119, July 11, 1957, p. 20 + 8 pages.

A detailed test and analysis of operating cost of a 309 hp. steam turbine as a prime mover for a 320 ton centrifugal air conditioning compressor.

15469 How Proper Air Distribution Aids Your Comfort. W. R. Yeary. *General Electric Review,* v. 60, July 1957, p. 10 + 3 pages.

Some basic facts about scientific heating and cooling of homes.

15470* Servicing the Air-Cooled Refrigeration Cycle. II. Electrical Operating Faults. William Schroer. *Heating & Air Conditioning, Contractor,* v. 48, July 1957, p. 48-51.

Functions, method of operation, and servicing of the principal electrical controls used on compressers used in air conditioning systems.

15471 Industrial Ventilation. 28 p. 1957. American Society of Heating and Air-Conditioning Engineers, New York. (TH 7684.F2 Am35.7i Over.)

Symposium papers deal with control of the industrial environment, dust particle characteristics, contaminant control, summer-winter comfort ventilation for industry, and cleaning of industrial effluents.

15472* Automatic Defrost Utilizing a Latent Heat Source. Otto J. Nussbaum. *Refrigerating Engineering,* v. 65, July 1957, p. 33 + 9 pages.

Reviews briefly some defrost methods which have remained in use, proposes a new heat source for defrost which undergoes a change of state and supplies latent heat.

15473* Simple Selection Method for Capillaries Derived From Physical Flow Conditions. L. Cooper, C. K. Chu, and W. R. Brisken. *Refrigerating Engineering,* v. 65, July 1957, p. 37 + 10 pages.

A mathematical analysis of capillary flow characteristics resulted in a simple means of tube selection.

15474 Symposium Session on Dehumidification. 28 p. 1957. American Society of Heating and Air-Conditioning Engineers, New York. (TH7687 Am35s)

A collection of five papers dealing with dehumidification by mechanical refrigeration, solid adsorbents, and liquid adsorbents; economics of dehumidified storage; typical dehumidification problems and their solution.

15475* Automatically Controlled Temperature and Humidity in Air-Conditioning. Leo Walter. *World Refrigeration and Air-Conditioning,* v. 8, June 1957, p. 330-332.

Several industrial systems are described.

See also: **14185** (ammonia absorption refrigeration); **14273** (analysis of Freon); **14655** (electronic cooling systems).

TEXTILES, FIBERS, LEATHER, AND PAPER

15476* The Standard Depths of Shade in Relation to the Assessment of Colorfastness of Dyes on Textiles. Paul Rabe.

American Dyestuff Reporter, v. 46, July 15, 1957, p. P504-P508.

The development of an objective method for measuring the depth of shade.

15477* Dyeing of Synthetic Fibers—A Dyer's Potpourri. S. G. Turnbull, Jr. *American Dyestuff Reporter*, v. 46, July 15, 1957, p. P509-P514.

Dyeing processes for several of the synthetic fibers now on the market.

15478* pH in Leather Making. H. G. Turley. *American Leather Chemists Association, Journal*, v. 52, July 1957, p. 354-360.

The significance of the pH value of the skin fibers, as opposed to the pH of the liquor, is emphasized.

15479* Some Notes Upon Hide and Leather Quality Interrelationships. Raymond Hauck and Robert M. Lollar. *American Leather Chemists Association, Journal*, v. 52, July 1957, p. 361-395.

15480 Bleeding of Oil-Type Preservatives. L. Leutritz. *Bell Laboratories Record*, v. 35, July 1957, p. 252-255.

To minimize loss of wood preservatives through "bleeding" creosotes or petroleums of high surface tension should be used, and the components that are liquid at normal temperatures should be held to a practical minimum.

15481 *British Paper and Board Makers' Association, Proceedings of the Technical Section*, v. 38, pt. 1, Feb. 1957, 148 p. (TS1080 P19p Vis.)

The nine papers deal with pitch tendency of pulps, pulp bleaching methods, use of rosin size, power transmission by various types of belting, holocellulose pulps, electronic drives for papermaking machines, leatherboard, and paper for packaging.

15482* (English.) **Effects of Mercerization on the Lateral Order Distribution of Cellulose.** Yoshizo Tsuda and Sadataka Mukoyama. *Chemical Society of Japan, Bulletin*, v. 30, Apr. 1957, p. 271-273.

Concludes that mercerization generally induces broadening of distribution.

15483 Cellulose Triacetate Production, Spinning and Properties. D. Finlayson and E. B. Thomas. *Chemistry & Industry*, no. 27, July 6, 1957, p. 928-935.

15484 The Hydrolysis of Cellulose and Its Relation to Structure. A. Sharples. *Faraday Society, Transactions*, v. 53, July 1957, p. 1003-1013.

Comparative hydrolytic studies on cellobiose, cotton, and a cotton hydrocellulose indicate that the reactive bonds in cotton are confined to the amorphous regions: the glucosidic bonds in the surfaces of the crystallites are remarkably resistant to degradation.

15485* Chemical Effects of High Energy Irradiation of Wood. Jean Mater. *Forest Products Journal*, v. 7, June 1957, p. 208-209.

Experimental work on irradiation of cellulose, dextran, lignin, and sawdust is discussed. This recently developed technique is expected to greatly influence the scope of chemical utilization of forest products.

15486* Dimensional Stabilization of Wood. J. Risi and Donald F. Arseneau. *Forest Products Journal*, v. 7, June 1957, p. 210-213.

A study was made of vapor-phase acetylation catalyzed by dimethylformamide, as well as crotonylation, crotylation, phthaloylation, butylation, and allylation of wood under various conditions. Antishrink efficiencies close to 100% are reported in some cases.

15487 Vinylidene Cyanide in Synthetic Fibre Production. Peter W. Sherwood. *Industrial Chemist*, v. 33, July 1957, p. 356-359.

Preparation and stabilization of monomer used in the manufacture of Darlan.

15488* New and Durable Antistatic Finishes. Emery I. Valko. *Modern Textiles Magazine*, v. 38, July 1957, p. 62-70.

Performance data on Aston LT and Aston 108.

15489* (English.) **Pitch Troubles Caused by Sulphite Pulp. IV.** Ch. Gustafsson, S. Kahila, and T. Lindh. *Paperi ja Puu*, v. 39, no. 5, 1957, p. 277-282.

The influence of different methods of barking of spruce wood and of storage successively on land and in water on the amounts of pitch from sulfite pulp deposited on a metal surface.

15490* (English.) **Experiments Concerning the Role of Redox Potential and Hemicellulose During Sulfate Cellulose Digestion.** Terje Enkvist, Björn Holm, Aarre Kourula, and Jarl Erik Martelin. *Paperi ja Puu*, v. 39, no. 6, 1957, p. 297-302.

A series of laboratory digestions of pine wood with NaOH solutions to which various reducing agents had been added showed no advantageous effect of the reducing agents comparable with that of the sulfides during a sulfate digestion. Measurements indicated that the redox potential of the cooking liquor at the beginning of digestion does not run parallel with the effectivity of the dissolution of lignin and hemicellulose.

15491 Coating on the Paper Machine. G. L. Booth. *Paper Mill News*, v. 80, July 6, 1957, p. 62 + 4 pages.

Review of equipment and methods for machine coated paper.

15492 Four Types of Synthetic Fiber Felt. Thomas J. Gillick, Jr. and Fred J. Magnant. *Product Engineering*, v. 28, July 1957, p. 178-182.

Synthetics have higher strength, better corrosion and heat resistance, less compression set than wool felts; changes in temperature and humidity have less effect, smoother surfaces can be obtained, and better filtering efficiency.

15493* Structural and Mechanical Properties of Vegetable Fibres. I. The Influence of Strain on the Orientation of Cellulose Microfibrils in Sisal Leaf Fibre. V. Balashov, R. D. Preston, G. W. Ripley, and L. C. Spark. *Royal Society, Proceedings*, v. 146, ser. B, June 25, 1957, p. 460-468 + 2 plates.

The spiral arrangement of the cellulose microfibrils in the secondary walls of the fibers undergoes regular change from the base to the tip of the leaf. Formulas are derived for the relative displacement of the microfibrils as the spiral angle changes during stretching.

15494* Reactive Dyes for Textile. T. Vickerstaff. *Society of Dyers and Colourists, Journal*, v. 73, June 1957, p. 237-247.

The Procion dyes will react with cellulose in presence of alkali. Their affinity for cellulose is low and diffusion inside cellulose fibers rapid, so that cold dyeing becomes feasible.

15495* Some Observations on the Dyeing of Dicel and Tricel Yarns and Fabrics. H. C. Olpin and J. Wood. *Society of Dyers and Colourists, Journal*, v. 73, June 1957, p. 247-258.

15496 The Flameproofing of Nylon. D. O. Douglas. *Society of Dyers and Colourists, Journal*, v. 73, June 1957, p. 258-263.

Thiourea-formaldehyde resins can be used to give a non-inflammable finish both on nylon net and on nylon dyed with chrome dyes.

15497* Modern Finishes for Leather. W. O. Nutt. *Society of Leather Trades' Chemists, Journal*, v. 41, June 1957, p. 189-199.

Resin binders of the acrylic and diene types commonly used for finishing are compared in the light of finish requirements and the effects of their components discussed. Some tests applicable to resin binders and suitable for use in the tannery laboratory are described.

15498* The Cross-Linking of Collagen With Aliphatic Epoxides. R. L. Sykes. *Society of Leather Trades' Chemists, Journal*, v. 41, June 1957, p. 199-206.

Application of the theory of rubber-like elasticity to the stress/strain characteristics of hydrothermally contracted collagen tendons before and after tannage indicated that these epoxides were cross-linking agents.

15499* The Control of Hard Spot and Red Heat on Wet Salted Calfskins. F. W. Woodroffe, F. G. Caughley, and M. E. Pattinson. *Society of Leather Trades' Chemists, Journal*, v. 41, June 1957, p. 206-216.

By incorporating in the dip boric acid and a bactericide, satisfactory control of hard spot and red heat has been achieved.

15500* (English.) **Analysis of Grinding Process Variables.** J. Bergström, H. Hellström, and B. Steenberg. *Svensk Papperstidning*, v. 60, June 15, 1957, p. 409-411.

Relations were determined between the grinding variables power consumption, peripheral speed, stone sharpness and production, and between these variables and pulp quality measures.

15501* (English.) **Chlorine Dioxide in the Bleaching of Dissolving Pulps.** Hannes Sihtola, et al. *Svensk Papperstidning*, v. 60, June 15, 1957, p. 412-419.

A determination of both the optimal conditions of a ClO_2 bleaching stage, and the most advantageous placing of a ClO_2 stage in a multi-stage bleaching system.

15502* (Swedish.) Press Section With Suction Pick Up. **Pressparti med sugavtagning. II.** Behavior of Suction Rolls. **Sugvalsars arbetssätt.** Lars Jordansson. *Svensk Papperstidning*, v. 60, June 30, 1957, p. 447-459.

Influence of width of suction boxes, velocity of air in the holes, linear pressure in the press, and quantity of water extracted by the press.

15503* (English.) **Alkaline Hypochlorite Oxidation of Spruce Wood.** Bo Alfredsson. *Svensk Papperstidning*, v. 60, July 15, 1957, p. 489-491.

Temperature has a considerable influence on hypochlorite consumption and the dissolution, degradation, and chlorination of the lignin. Pretreatment with diazomethane has an inhibitory effect.

15504 Rigidity, Moisture and Fibre Structure. R. Meredith. *Textile Institute, Journal (Transactions)*, v. 48, June 1957, p. T163-T174.

An analysis of the relation between modulus of torsional rigidity and moisture regain for ramie, mercerized cotton, Fortisan, viscose rayon, wool, and nylon.

15505 Water-Repellent Treatment of Textiles With Silicones. Studies on the Mechanisms of Two Processes. J. A. C. Watt. *Textile Institute, Journal (Transactions)*, v. 48, June 1957, p. T175-T192.

A comparison of two processes: one involving use of a reactive fluid, polymethylsiloxane, with an oil-soluble metallic salt as catalyst; the second involving a less reactive fluid, polydimethylsiloxane and the water-soluble salt, zirconium oxychloride.

15506 The Effect of Temperature on the Initial Tensile Modulus of Some Wet Fibres. J. C. Guthrie. *Textile Institute, Journal (Transactions)*, v. 48, June 1957, p. T193-T200.

Initial tensile moduli were measured for various wet fibers over the temperature range 22 to 100 C. The importance of the initial modulus of the wet fiber in textile wet processing is indicated.

15507* Electrostatic Properties of Finished Cellulose Acetate Yarn. G. J. Sprokel. *Textile Research Journal*, v. 27, July 1957, p. 501-515.

15508* A Study of the Weathering Characteristics of Cotton Fabrics Containing Inorganic Compounds. II. Further Work on Copper-Chromium Treatments. G. R. F. Rose and C. H. Bayley. *Textile Research Journal*, v. 27, July 1957, p. 519-528.

Effect of outdoor weathering on unbleached and bleached cotton duck treated with $CuCO_3$ and Cr_2O_3, Cr_2O_3 after treated with Cu naphthenate and Cu 8-hydroxyquinolate, and Cr naphthenate mixed with Cu naphthenate and Cu 8-hydroxyquinolinate respectively; and unbleached cotton sheeting treated with a mixture of $CuCO_3$ and Cr_2O_3.

15509 Mechanical Properties of Glass-Fabric Honeycomb Cores. Edward W. Kuenzi. *U. S. Department of Agriculture, Forest Products Laboratory, Report No.* 1861, Mar. 1957, 48 p. (TS800 Un3.3r Contin.)

Commercially produced cores for use in structural sandwich construction were tested at 73 F and 50% relative humidity, and after exposure for 60 days at 100 F and 100% relative humidity.

15510 Thermal Radiation Damage to Cellulosic Materials. II. Ignition of Alpha Cellulose by Square-Wave Exposure. C. P. Butler, S. B. Martin, and W. Lai. *U. S. Naval Radiological Defense Laboratory, Research and Development Technical Report*, USNRDL-TR-135, Nov. 1956, 78 p. (QC475 Un3.5r Contin.)

The ignition behavior of blackened α-cellulose when exposed to square-wave inputs of radiant thermal energy is detailed for a wide range of irradiance levels and exposure times.

See also: **14195** (methylene blue number of cellulose); **14204** (analysis of dyes); **15405** (spectra and structure of cellulose); **15439** (B.O.D. and textile waste problem); **15521** (wood glues).

WELDING AND JOINING

15511* Automatic Arc Welding Techniques and Applications. II. Controls, Handling Equipment, Industrial Installations. Peter Shaw. *Automation Progress*, v. 2, July 1957, p. 328-333.

An explanation of the automatic control of arc length and welding speed.

15512 Inert-Gas-Shielded Consumable-Electrode Welding of Molybdenum. Norman E. Weare, Robert E. Monroe, and David C. Martin. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-1180, Apr. 1957, 24 p. (UF767 U3b Contin.)

Arc stability and metal transfer in the welding of Mo could be improved using d.c., straight polarity, an electrode wire coated with a compound to increase the emission of electrons, and a He shield. The inert-gas-shielded consumable-electrode welding process may have its best application in welding thick Mo plate, whereas W-arc welding would be better for welding sheet ⅛ in. thick or less.

15513* Welding Speed and Efficiency of Iron-Powder Coated Electrodes. J. ter Berg. *British Welding Journal*, v. 4, June 1957, p. 253-256.

Formulas are developed indicating how to obtain high deposition speeds together with high energy efficiencies.

15514* The Application of Carbon Dioxide Shielding to the Continuous Flux-Covered Electrode Process. P. L. J. Leder. *British Welding Journal*, v. 4, June 1957, p. 274-281.

A new "Fusarc/CO_2" process with a special type of flux covering and CO_2 shielding is described.

15515* The Problem of Embrittlement in the Welding of Austenitic Heat-Resisting Steels. Henry F. Tremlett. *British Welding Journal*, v. 4, June 1957, p. 283-287.

A study of σ formation at 700 and 900 C after heating up to 2000 hr. was made; solution treatments of 4 hr. at 1050, 1150, and 1250 C, and 5 min. at 1350 C were used prior to heating at the σ forming temperatures. The effect of welding heat was studied by heating in a flash-butt welding machine before heating for 1000 hr. at 900 C. Bend tests on specimens aged for 1000 hr. at 875 C and tested at room temperature showed that the parent steel away from the weld had lowest ductility in the W steel, but the heat-affected zone was alike in all steels. Tested at 750 C, all steels showed a reasonable measure of ductility. By adjustment of C and Si content a composition could be reached which remained austenitic at solution temperatures and by further adjustment, one which did not produce σ phase on prolonged subsequent reheating at 900 C. Although the temperatures reached in the heat affected zone are extremely high, the time at temperature is very short in arc welding processes. The effect of the short time is to tend to prevent the development of grain-boundary δ-ferrite, and final embrittlement of the heat-affected zone of steels which are

initially austenitic, is not greater than the embrittlement of the parent steel. Steels which have been made to the requirements for freedom from ferrite at solution temperature, and freedom from σ at 900 C, will not embrittle to a greater degree in the heat-affected zone. The relationship between composition and weld metal constitution "as-deposited" was studied for a wide range of commercial electrodes.

15516 Automatic Argon Arc Welding of Stainless Steels With Consumable Electrodes in Various Positions. A. N. Akulov and N. Iu. Pal'chuk. *Henry Brutcher Translation No.* 3906, 8 p. + 1 plate. (From *Svarochnoe Proizvodstvo*, no. 6, June 1956, p. 27-29.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 11899, v. 5, Sept. 1956.

15517* (German.) Welding Technique in the Construction of Electric Machines. **Die Schweisstechnik im Elektromaschinenbau.** Horst Pflug. *ETZ, Elektrotechnische Zeitschrift*, v. 9, Ausgabe B, June 1957, p. 226-228.

New welding methods permit saving of weight and production time, leading to quicker delivery of products.

15518* (German.) Accident Prevention in Electric Welding. **Arbeits- und Unfallschutz beim Elektroschweissen.** Günter Engel. *ETZ, Elektrotechnische Zeitschrift*, v. 9, Ausgabe B, June 1957, p. 229-231.

Sources of danger in welding can be overcome by careful handling and correct use of protective measures.

15519* (German.) The Present State of Shielded Arc Welding in Inert Gas and Carbon Dioxide. **Der heutige Stand der Schutzgasschweissung unter Edelgas und Kohlendioxyd.** Wilhelm Mantel and L. Wolff. *ETZ, Elektrotechnische Zeitschrift*, v. 9, Ausgabe B, June 1957, p. 232-237.

Characteristics; types; uses; methods; equipment.

15520* (German.) Welding Electrodes. **Schweisselektroden.** G. M. Blanc. *ETZ, Elektrotechnische Zeitschrift*, v. 9, Ausgabe B, June 1957, p. 238-244.

Electrode manufacture; data on welding arcs; importance of electrode coatings; electrodes for welding unalloyed and low-alloy steels; special electrodes for high-alloy steels, nonferrous metals, and build-up welding.

15521* How Long Will It Last—A Study of Glue Line Durability. C. C. Booth and J. W. Maxwell. *Forest Products Journal*, v. 7, June 1957, p. 187-195.

The superiority of phenol- and resorcinol-formaldehyde resins is clearly established for severe service conditions. Reasonably long endurance can be expected with urea-formaldehyde resins when not subjected to direct exposure to the elements.

15522* (German.) The Application of Welding Processes to Cast Iron. **Die Anwendung der Schweissverfahren bei Gusseisen.** Carl Hase. *Giesserei*, v. 44, June 20, 1957, p. 370-373.

Working methods and range of application of the oxy-acetylene and electric arc hot welding processes. Calculation of the economic efficiency of cold and hot welding. Thermic cutting processes. Application of the welded joint as a design element.

15523* (German.) Welding of Cast Iron. **Schweissen von Gusseisen.** Hermann Beyer. *Giesserei*, v. 44, June 20, 1957, p. 374-382.

Characteristics of the material. Weldable and nonweldable cast iron. Stress conditions. Welding rods. Hot, semi-hot, and cold welding. Structure and strength of the cast iron materials. Economic efficiency of cast iron welding.

15524* (German.) The Application of Modern Welding Processes to Steel and Malleable Iron Castings. **Die Anwendung moderner Schweissverfahren für Stahl- und Temperguss.** Hans Zeuner and Kurt Zimmermann. *Giesserei*, v. 44, June 20, 1957, p. 382-388.

Welding methods. Electrodes. Effect of alloying elements on weldability. Welded cast iron structures.

15525* (Polish.) Some Remarks About the Weldability of Steel. **Kilka uwag o spawalności stali.** Stanisław Butnicki. *Hutnik*, v. 24, Mar. 1957, p. 100-103.

Classification of steel according to its quality. Relationship of weldability to physical and chemical properties.

15526* (Russian.) Process of Seam-Butt Electric Welding of Thin Sheets. **O protsesse kontaktnoi shovno-stykovoi elektrosvarki tonkikh listov.** P. P. Mitris and R. B. Rudzit. *Latvijas PSR Zinātnu Akademijas, Vestis*, no. 4, 1957, p. 129-142.

Principles of the method; advantages; equipment; experimental results.

15527 Heating Methods for Modern Brazing Operations. *Metal Progress*, v. 72, July 1957, p. 65-76.

Some observations about the brazing method (fits, assembly, cleanliness, and alloys) are followed by specific information about three methods of heating for mass production. In furnaces with protective atmospheres or vacuum, in molten salt baths, and rapid heating in air by H.F. electric currents.

15528* (German.) Longer Tool Life and Economy Through Building up Tool Tips by Welding. **Höhere Schneidhaltigkeit und Wirtschaftlichkeit durch Auftragsschweissung.** Karl Schmidt. *Schweissen und Schneiden*, v. 9, June 1957, p. 277-278.

Tool wear can be greatly reduced by applying a hard wear resistant metal to the tool tip.

15529* (German.) Application of Welding in the Repair of Machinery. **Stand des Schweissens bei der Maschineninstandhaltung.** K. Weber. *Schweissen und Schneiden*, v. 9, June 1957, p. 280-283.

For the welding of cast iron a suitable pre-heating procedure eliminates any dangers, especially as far as distortion and cracking are concerned. High class cast iron filler rods for depositing high Mn weld metal have been developed. Low temperature welding is also used, and if the weld is properly designed and suitably re-inforced satisfactory working conditions can be obtained.

15530* (German.) Special Welding Methods in the Manufacture of Alloy Sheet Steel Structures. **Schweisstechnische Sonderfertigung von Dünnblechkonstruktionen aus legierten Stählen.** W. Liebig. *Schweissen und Schneiden*, v. 9, June 1957, p. 297-298.

15531 Fatigue Properties of Welds. J. G. Whitman. *Sheet Metal Industries*, v. 34, July 1957, p. 529-538.

Various factors which are responsible for the reduction in fatigue strength of a welded joint, as compared with an unwelded specimen.

15532 How to Braze Titanium. *Steel*, v. 141, July 22, 1957, p. 103-106.

Induction brazing appears best. Requisites: proper surface preparation and atmospheres or fluxes. Shear strengths of various brazed joints are tabulated.

15533 General Survey of Data on the Reliability of Metal-Bonding Adhesive Processes. H. W. Eickner. *U. S. Department of Agriculture, Forest Products Laboratory, Report No.* 1862, May 1957, 8 p. (TS800 Un3.3r Contin.)

A survey of the reliability of adhesive-bonding processes for metals based on the variability of lap-joint strength data from tests for adhesive acceptance, laboratory control, adhesive storage, and production control. There were no indications that the coefficient of variation for the strength data was greater for one type of adhesive than for another.

15534 Welding and Related Procedures Encountered in a Modern Steel Foundry . Samuel W. Gearhart, Jr. *Welding Journal*, v. 36, July 1957, p. 693-702.

Welding processes have been adopted for improving casting quality, simplification of casting design through fusion joining processes, and incorporation of castings in welded structures.

15535 High-Frequency Resistance Welding. Wallace C. Rudd. *Welding Journal*, v. 36, July 1957, p. 703-707.

A special case of H.F. resistance heating now being used for tube and strip welding.

15536 The Metallurgy of the Welding of Certain Austenitic Heat- and Corrosion-Resistant Alloys. Anthony H. Waterfield and Russ P. Culbertson. *Welding and Metal Fabrication*, v. 25, July 1957, p. 244-250.

See also: **15080** (brittleness of welds); **15108** (hot cracking of welds); **15120** (notch toughness and weldability of structural steels); **15126** (Ti welded joints); **15166** (hydrogen in steel welds); **15168** (structure of welds); **15224** (examination of mild steel welds); **15229** (inert arc welding of uranium plates).

MISCELLANEOUS

15537* Orthogonal Harmonic Functions in Space. Thomas A. Elkins. *American Mathematical Society, Proceedings*, v. 8, June 1957, p. 500-509.

An attempt to generalize to three dimensions certain simple properties of harmonic functions in two dimensions.

15538* A Prüfer Transformation for Matrix Differential Equations. John H. Barrett. *American Mathematical Society, Proceedings*, v. 8, June 1957, p. 510-518.

15539 Boost Your Profits With Safety. L. E. Johnston. *American Paint Journal*, v. 41, July 15, 1957, p. 46 + 3 pages.

Some practical ideas on industrial housekeeping.

15540 American Society for Testing Materials, Proceedings. v. LVI. 1498 p. 1956. American Society for Testing Materials, Philadelphia. (TA401 Am35p Vis.)

Includes numerous committee reports and technical papers on properties of ferrous and non-ferrous metals; fatigue; cement, concrete, and concrete aggregates; soils; and general testing of other miscellaneous materials.

15541 (German.) Research by Contract at the Battelle Institute. **Vertragsforschung im Battelle-Institut.** H. Gwosdz. Paper from "Arbeitsgemeinschaft der technisch-wissenschaftlichen Bibliotheken. Bericht uber die 6. Tagung in Frankfurt (Main) Grosses Auditorium des Battelle-Instituts am 14. und 15. März 1956". p. 9-16. (Z675.T3 Ar16)

After reviewing the origin and history of the Battelle Memorial Institute in the U. S., describes the establishment and organization of the Frankfurt installation. Discusses the types of clients who come to Battelle with research problems and the need for keeping research results confidential, for the use of the sponsor only. Concludes with a discussion of contractual arrangement and the relationship between the sponsor and the Institute.

15542* Measurement of Leakage Resistances and Static Electrification. Bent Barnholdt and R. E. H. Rasmussen. *Archives of Industrial Health*, v. 16, July 1957, p. 67-76.

An investigation on the leakage resistance of personnel and floors and on the possibility of the building up of charges on personnel showed that the use of insulating floor coverings as well as insulating footwear should not be allowed in rooms in which work is in progress involving the use of volatile inflammable substances.

15543 Summary of Medical Studies on Hiroshima Children Exposed to the Atomic Bomb, 1951-1953. Wataru W. Sutow. *Atomic Bomb Casualty Commission (U. S. Atomic Energy Commission)*, NYO-4478, Apr. 1957, 97 p. (UF767 U3ny Contin.)

15544* Binomial Sampling Schemes and the Concept of Information. D. V. Lindley. *Biometrika*, v. 44, June 1957, p. 179-186.

Methods of sampling a binomial population in order to obtain a prescribed accuracy in the determination of the unknown proportion are discussed.

15545* Some Statistics Associated With the Random Disorientation of Cubes. J. K. Mackenzie and M. J. Thomson. *Biometrika*, v. 44, June 1957, p. 205-210.

A Monte Carlo method is used to estimate the frequency functions of various angles in a random aggregate of cubic crystals.

15546* On the Solution of Estimating Equations for Truncated and Censored Samples From Normal Populations. A. Clifford Cohen, Jr. *Biometrika*, v. 44, June 1957, p. 225-236.

15547* On the Analyticity of the Solutions of Linear Elliptic Systems of Partial Differential Equations. C. B. Morrey, Jr. and L. Nirenberg. *Communications on Pure and Applied Mathematics*, v. 10, May 1957, p. 271-290.

15548* International Encyclopedia of Cosmetic Material Trade Names. Maison G. deNavarre. 369 p. 1957. Moore Publishing Co., New York. (TP983 D41i)

15549* An Analysis of Tracking Behavior in Terms of Lead-Lag Errors. W. D. Garvey and L. L. Mitnick. *Journal of Experimental Psychology*, v. 53, June 1957, p. 372-378.

Through the use of a mathematical model it is possible to compare the performance of the human operator in a compensatory tracking task with that of the mathematically simplest mechanism which might be substituted in the system to perform the operator's task.

15550* Communist China in World Politics. A. Doak Barnett, et al. *Journal of International Affairs*, v. 11, no. 2, 1957, p. 99-189.

A series of nine articles by experts on the subject.

15551 Manufacturing Methods and Processes. Arthur C. Ansley. 561 p. 1957. Chilton Co., Philadelphia. (TS145 An82m)

Newest developments in manufacturing methods, products to which they are adapted, and economics of their use.

15552 Evaluation of Various Types of Personnel Shelters Exposed to an Atomic Explosion. L. J. Vortman, et al. *Operation Teapot (U. S. Atomic Energy Commission)*, WT-1218, May 1957, 121 p. (UF767 Un3.1wt Contin.)

15553* Good Plant Layout Promotes Safety. R. W. Mallick. *Plant*, v. 16, July 1957, p. 42-45.

Various aspects of building design which affect safety of employees.

15554 Mathematical Tables—A Bibliography. Charles R. Sexton. *Product Engineering*, v. 28, July 1957, p. 183-194.

An annotated list of tables of mathematical functions useful in the solution of engineering problems.

15555* (Polish.) Test Experiments Concerning Conditions of Explosive Decomposition of Ammonium Nitrate. **Doświadczenia i próby nad warunkami wybuchowego rozkładu azotanu amonowego.** S. Pawlikowski and A. Kawiński. *Przemysł Chemiczny*, v. 13, Apr. 1957, p. 220-224.

The value of the "limiting" pressure (about 6 atm.), above which the explosive decomposition of NH_4NO_3 occurred, was determined.

15556 (Dutch.) A Quarter of a Century of TNO 1932-1957. A Memorial Book on the First 25 Years of Activity of the TNO Organization. May 1957. **Een Kwarteeuw TNO 1932-1957. Gedenkboek bij de Voltooiing van de eerste 25 Jaar Werkzaamheid van de Organisatie TNO Op Mei 1957.** Sections individually paged. 1957. Nederlandse Organisatie voor Toegepast - Natuurwetenschappelijk Onderzoek, Netherlands. (T177.N3 N28e)

Information and illustrations on the birth and growth of The Applied Scientific Research Organization (TNO), its connections with science, agriculture, and defense in the Netherlands for the first 25 years of its existence, its recognition abroad, its practical activities and financial status.

15557 Route-Mapping and Position-Locating in Unexplored Regions. Wilhelm Filchner, Erich Przybyllok, and Toni Hagen. 288 p. 1957. Academic Press, New York. (Q116 F47r)

Methods and instruments used in route-mapping, position-finding, and altitude-measurements; route-mapping and topographical surveys with the aid of photographs.

15558 1957 Blue Book and Catalog. *Soap and Chemical Specialties*, v. 30, 1957, 272 p.

Annual buyers guide, directory, and reference volume for manufacturers, converters, and repackers of soaps, detergents, insecticides, disinfectants, polishes, cleaners, and chemical specialties.

15559* **Implementing Research and Development.** Emil Ott and Carl F. Prutton. *SRI, Journal*, v. 1, no. 2, 1957, p. 41-47.

Report on industrial research procedures in a large company highlights some experience-tested guiding principles.

15560 **The Structure and Function of Skin.** William Montagna. 356 p. 1956. Academic Press, New York. (QM481 M76s)

Points out that the skin, dermis and epidermis, is a unified, integrated system.

15561* (English.) **Suppression of Evaporation From Snow-Fields.** Kjell Groth. *Tellus*, v. 9, May 1957, p. 159-163 + 1 plate.

An outline of the possibilities of using surface films for suppressing evaporation. Effect of fatty alcohol films.

15562 **Topology.** E. M. Patterson. 128 p. 1956. Interscience Publishers, New York. (QA611 P27t)

An introductory text covering topological spaces, homotopy, simplicial complexes, and homology.

15563 **Trademarks of the World.** Yusaku Kamekura. 192 p. George Wittenborn, New York. (T325 K12t)

A collection of 700 outstanding trademarks, vividly presented. Japanese crests are discussed as being worthy of consideration by graphic designers.

15564* (Russian.) Investigation of the Toxicity of Titanium and Its Compounds. **Issledovanie toksichnosti titana i ego soedinenii.** O. Ia. Mogilevskaia, E. A. Mel'nikova, and N. V. Mezentseva. *Tsvetnye Metally*, v. 30, Apr. 1957, p. 51-55.

The harmful effects of Ti, TiO_2, and TiC dusts on the human organisms are discussed in detail. Measures for counteracting the highly toxic effect of $TiCl_4$ vapors.

15565 **Twentieth Annual Proceedings of the Railway Fuel and Traveling Engineers' Association.** 244 p. 1956. Railway Fuel and Traveling Engineers' Assn., Chicago. (TJ607 R13a Vis.)

Includes papers and discussions on safety, handling, supervisory development, the gas-turbine electric locomotive, vapor steam generators, freight train handling, and economy diesel fuels.

15566 **Fractional Factorial Experiment Designs for Factors at Two Levels.** *U. S. Department of Commerce, National Bureau of Standards, Applied Mathematics Series* 48, Apr. 1957, 85 p. (QA55 Un3.5a)

See also: **14174** (fire protection for chemicals); **15420** (hazards in handling styrene).